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Utah Ski Use: A Descriptie Analysis

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UTAH SKI AREA USE: A DESCRIPTIVE ANALYSIS

by

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ABSTRACT

Utah Ski Area Use: A Descriptive Analysis

by

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Use of ski areas in the Wasatch Mountains of Utah has increased rapidly over the last two decades. To facilitate planning and management of programs and facilities designed to meet this need, public and private organizations should have information which delineates the factors affecting use of these ski areas. The objectives of this study were therefore: (1) to determine what factors were responsible for variation in use at Utah ski areas, (2) to determine the relative importance of these factors in explaining ski area use, (3) to ascertain if these variables explaining use differ significantly between two ski seasons, (4) to determine if the factors explaining use differ significantly between various ski areas, and (5) to analyze the planning and management implications of this study.

Six Utah ski areas were examined over two ski seasons. Data concerning site characteristics, management variables and locational variables for each ski area was collected. Methods of data collection included use of existing studies and information, telephone interviews and in-person interviews with ski

area managers. The main statistical procedures utilized were stepwise multiple regression analysis and partial correlation analysis.

Results of these analyses indicated that two site characteristic variables, (1) total number of chairlifts and aerial tramways at each ski area, and (2) average snow depth at each ski area were closely related to variation in ski area use. These two variables were the most important for both the 1972-73 and 1974-75 ski seasons, as well as the average of these two seasons.

The analyses indicated that vertical drop and lift ticket price were the two variables most closely associated with variation in use at ski areas which received a majority of their use from non-Utah residents. For those ski areas which received a majority of use from residents of Utah's Wasatch Front, the variables most closely related to variation in use were: (1) number of years in operation as a ski area, and (2) total advertising expenditures of each ski area.

Implications for planning and management of ski areas in the Wasatch Mountains of Utah are discussed. Possible refinements of this technique for future applications are suggested. A glossary of terms is included.

(114 pages)

CHAPTER I

INTRODUCTION

Statement of General Problem

The popularity of skiing as a recreational pursuit in the United States has increased dramatically over the last 2 decades. Exact figures as to the magnitude of this increase are not available. However, the following figures should serve to illustrate the extent of this increase.

For the 12 western states (Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming) Herrington (1967) found that skier visits had tripled between 1955 and 1963. This represented an increase from 1.4 million skier visits to 4.3 million. The study estimated that expenditures for ski equipment and ski trips during the 1963-64 ski season represented a $115.1 million industry in the western states. Similar figures for more recent years are not available. However, the magnitude of growth in the ski industry in recent years is illustrated by Vail, Colorado. This ski area, which has only existed about 10 years, reported operating revenues of almost $11 million for the 1974-75 ski season (Bemis and Grout, 1975).

For Utah ski areas, skier visits increased from an estimated 120,879 in 1955-56 to an estimated 340,277 in 1962-63. This represented an average annual increase in participation of 14 percent. According to Hunt (1974), a ski

study conducted by the Institute for the Study of Outdoor Recreation and Tourism at Utah State University during 1972-73 found total skier visits to Utah areas that season was 1,370,000. A similar study 2 years later estimated total skier visits to Utah areas for the 1974-75 season at 1,411,000 (Anderson and Hunt, 1975). The growth of skier visits in Utah since 1962 is presented graphically in Appendix F.

Associated with this increase in Utah skiing has been the expansion of existing ski areas and the creation of new ones. Herrington (1967) reported that uphill (lift) capacity at ski areas in the 12 western states had increased from 66 million Vertical Transport Feet per hour (VTF/hr) in 1955 to 215 million VTF/hr in 1964. Similarly, a study by the Utah State Foundation (1970) found that uphill capacity at eight Utah ski areas had increased by an average of 154 percent between 1960 and 1970. The ski areas considered in the Utah State Foundation study were Beaver Mountain, Alta, Brighton, Brian Head, Park City, Park City West, Snow Basin and Sundance. Areas constructed since 1970 (principally Snowbird) have significantly increased lift capacity.

This increase in uphill capacity has been accompanied by a rapid increase in construction of tourist and vacation related developments. Condominiums, motels, second homes, restaurants, bars, shops, golf courses, tennis courts and many other facilities are frequently developed in conjunction with ski areas. Indeed, entirely new four season resorts requiring multi-million dollar investments by large corporations have been created or are presently being planned in response to this increased interest in Utah skiing.

The economic activity generated by ski developments in Utah has also grown rapidly. Jensen (1964) estimated that gross revenue for the Utah ski industry exceeded $2 million annually. Hunt (1974) estimated that total skier expenditures in Utah for the 1972-73 season amounted to about $19 million. This figure, which does not include expenditures for gasoline or ski equipment, was estimated to be almost $22 million for the 1974-75 season (Anderson and Hunt, 1975).

It is apparent from the preceding discussion that skiing has become increasingly important as a recreational activity in Utah. Associated with this increased emphasis have been demands for more public and private lands for skiing. In each instance where a new ski area is created or an existing one expanded, an understanding of the factors that are important in determining skier use is a necessity. Such knowledge would be of value to those concerned with potential environmental consequences, as well as potential social and economic impacts of development activities.

This information would also facilitate planning and management in both private developments and public agencies. For example, several major ski areas are located in canyons which supply culinary water to the Salt Lake City area. Decisions regarding ski area expansion or development could have adverse impacts on residents of this area through disruption of watershed processes. The decision of whether potential skier use is sufficient to justify such development would be facilitated by knowledge of the factors which are related to ski area use.

To this point in time, the few studies concerned with ski areas dealt mainly with characterizing the user in terms of residence, socio-economic status, expenditure patterns, etc. While this type of information is beneficial to the management of the particular ski area at which it was collected, it has very little value for generalization.

The problem of determining what factors are influential concerning the amount of use a ski area receives cannot be answered by these kinds of descriptions since they address the user and not the supply or site variables. The main weakness in this approach is that the characteristics of the users are dynamic rather than static phenomena. As such they are subject to frequent change.

With increasing pressures to expand or create new ski facilities, and in light of the large capital investments that must be made in such instances, it is imperative that decision-makers in both the public and private sectors have the ability to understand the factors affecting use of these facilities. A major goal of this study was to explore the relationships between use of certain Utah ski areas and the area's physical site characteristics, management practices and locational variables. It was with this perception of research needs that this analysis was implemented.

Objectives

Use of Utah ski areas has increased rapidly over the last 2 decades. This has caused a large increase in recreational development in terms of new

lifts and lodges, new ski areas, and many other related facilities. Public agencies involved with land and recreation management and private corporations involved in the ski industry must plan and manage facilities and programs to meet these needs. To facilitate decision-making by these entities, information should be available which delineates the relationships between ski area use and characteristics which describe these areas in terms of various site characteristics, management practices and locational variables.

Therefore, the objectives of this study are:

1. To delineate the factors which are responsible for variation in use at selected Utah ski areas.
2. To determine the relative importance of these factors in explaining variation at selected Utah ski areas.
3. To ascertain if the factors related to use differ significantly between two ski seasons.
4. To determine if the factors related to use differ significantly between "Nonresident" ski areas and "Wasatch Front Resident" ski areas.
5. To analyze the planning and management implications developed by this study.

Format of Study

The data were stratified for analysis to test for significant differences. This was done in terms of five different subgroups. The first two dealt with the

1972-73 and 1974-75 ski seasons. These particular seasons were the only ones included in the Utah Winter Sports Surveys conducted by the Institute for the Study of Outdoor Recreation and Tourism at Utah State University. Accordingly, these were the only two ski seasons for which reliable use figures were available. The inclusion of two seasons allowed for comparison of important factors over time. The third subgroup was an average of the 1972-73 and 1974-75 ski seasons. This was included in the event that disparate results were obtained for the individual seasons.

The last two subgroups consisted of "Nonresident" and "Wasatch Front Resident" ski areas. These represent the two major categories of ski areas found in the study area (Hunt, 1974). The distinction is based on the proportion of use received at a ski area from non-Utah residents and residents of Utah's Wasatch Front. Both categories were included in this study because these areas have different use patterns, facilities, impacts and problems.

CHAPTER II

LITERATURE REVIEW

Introduction

Numerous studies concerning use of outdoor recreation facilities have been conducted in recent years. The goal of these studies has usually been to provide data to facilitate planning and management decisions. Presented in this chapter are four major categories of techniques which have been employed to analyze use of developed recreation sites. These are: (1) linear projection, (2) economic and gravity models, (3) user characteristic models, and (4) site characteristic models.

Use Estimation Techniques

Linear projection

Some of the first attempts to estimate recreational use (and a technique which is still commonly employed) extrapolated projected use from historical use data. Dyer and Whaley (1968) feel that this method may be of limited value for predicting aggregate recreational use on the national or regional level. However, they doubt its utility for predicting use of specific recreational facilities.

There are several problems with this method. First, accurate data on past use of recreational facilities is rarely available. Where it is

available, it usually does not cover enough years upon which to base reliable projections.

Secondly, it ignores the entire phenomena of market growth. LaPage (1974) developed a typology which relates camping market expansion to a progressive stages-of-growth model. Extrapolation of past use assumes a direct linear relation between number of facilities and use. However, LaPage implies that for camping, the relationship approximates a sigmoidal growth curve (Krebs, 1972). This suggests that an activity will have many different growth rates over time. Therefore, extrapolation of future use levels based on a short time period may result in extremely high or low estimates of use, depending on what stage of growth the particular activity is in.

Another limitation of this method is that it cannot be used to project use of recreational facilities which are unprecedented in a particular area. The classic example here is the case in which one community has a swimming pool that is heavily used while another community has no pool. Extrapolating from historical use data, one would assume that another pool in the community which already has one would be heavily used also. The desire of the other community to swim is underestimated because they have not had the opportunity to express their desire through past participation. While this example may seem over-simplified, it does serve to illustrate how imbalances in facilities can be perpetuated by this method.

Economic and gravity models

Other early attempts to describe and estimate use of outdoor recreation facilities were conducted by Marion Clawson of Resources for the Future, Inc. His analyses employ the basic tools of econometrics. These analyses include the prediction of recreational use by means of a gravity model, which estimates use based on the distance a facility is from population centers. Another of these methods is market analysis. In this approach, the costs incurred by recreationist in on-site activity and travel to and from the site are considered an expression of the value of the experience. By using these costs as an expression of the willingness to pay of the recreationists, a "demand" figure for various recreational activities can be developed. When this demand figure is combined with a supply function for recreational facilities, an equilibrium supply level can be calculated (Clawson and Knetsch, 1966).

There is a serious problem in utilizing this approach because it confuses the concepts of demand and consumption. In an economic sense, demand is considered to be the quantity of a good or service purchased at various supply or price levels. It is a collective expression of the willingness to pay of many individual consumers, for a given item. As such it is an indicator of the optimal or equilibrium supply level for a given good or service. It is at this point that enough of the good or service is provided to satisfy all demand (Freeman, Haveman and Kneese, 1973). The weakness in Clawson's approach is that the "demand" figures obtained through his analyses do not measure real

economic demand. They measure consumption or participation rates for recreation activities.

Consumption or participation is a function of available supply of recreational opportunities and not necessarily an expression of real recreational needs and preferences. This misuse of economic analysis is criticized by Knetsch in the statement:

> The myths persist that somehow we are able to multiply population figures by recreation activity participation rates and call the product "demand" and that such figures justify doing just about anything we care to in the name of satisfying recreational needs. (Knetsch, 1974, p. 131)

Gravity models have been used quite frequently in research situations which try to estimate the magnitude of interaction or movement of people and things through space. This is accomplished through mathematical expressions which consider population and distance variables (Isard, 1974).

The gravity model technique has been applied to recreational situations with some success. For example, this technique was utilized to develop statistical use estimates for outdoor recreation in Utah. In a study conducted at Utah State University, estimates of the probability of use of 22 alternative boating sites by residents of Cache and Box Elder Counties were derived. Travel distances between the residence of boaters and various boating sites were considered an expression of relative site utilities of the boaters. Using this method, boating use probabilities of these reservoirs were developed with about 80 percent accuracy (Wennergren and Nielsen, 1968).

User characteristic models

Another approach to estimating recreational use concentrates on the characteristics of the users, rather than the facility. These studies analyze the socio-economic variables associated with a population and then try to relate activity types and participation rates with certain socio-economic characteristics.

The Herrington study was one of the first attempts to critically analyze the use of ski areas in terms of user characteristics. In this study, a regression model was developed which relates user characteristics (socio-economic variables) to ski area use. Based on the findings of the Outdoor Recreation Resources Review Commission (1962), this study examined the effects of population, per capita income and leisure time on ski area use. It was found that these three variables explained 95 percent of the variation in total annual use between 1955-56 and 1963-64 at ski areas in the 12 western states. The final equation was:

$$Y = 6045.603 + 347.35926X_1 + 5901.3576X_2 - 534.634X_3$$

where: Y = skier attendance in thousands of visits

X_1 = population of the western states in millions of people

X_2 = per capita income of U.S. in thousands of 1960 dollars

X_3 = leisure hours per week per worker

This study is exemplary of a potential weakness in regression analysis. One would logically expect leisure time and ski area use to be positively correlated. However, in this study the coefficient for leisure time is negatively related to use. This exemplifies the possibility of including variables that do

not measure the intended attribute (Robeson and Parent, 1974). It is also interesting to note that the author made no mention of the significance of this negative relationship on the leisure variable in the report.

In another study, Dyer and Whaley (1968) included two gravity variables along with socio-economic variables in a study of fishing and camping participation rates. For the fishing case, multiple regression analysis determined that 74 percent of the variation in use at two streams in the Uinta Mountains of Utah could be explained by three variables. The individual contributions to total use by various Utah counties (i) were explained in terms of the following variables: (1) round trip distance in miles from county i to the stream, (2) the percentage of population in county i which is 65 years or older in age, and (3) the percentage of families in county i with annual incomes in the $4000 to $6999 range.

In the camping case, multiple regression analysis determined that 57 percent of the variation in campground use in Logan Canyon, Utah, was a function of three variables. The analysis was implemented in terms of the contribution of various counties to total use. The variables in the final equation were: (1) the number of competing campgrounds within approximately a 75 mile drive of each origin, (2) the logarithm of the distance in miles between the origin and the mouth of Logan Canyon, and (3) a dummy variable which separates Idaho and Utah residents.

Studies which attempt to relate user characteristics and socio-economic variables to recreational use have dominated recreation research in the past. They have contributed to a misunderstanding or "fogweed" as to what factors are

important in determining recreation participation (LaPage, 1971). This has been due mainly to the researcher's inability to account for the inherent cultural differences within a population, as well as the fact that these characteristics are affected by attitudes towards such things as work, leisure, religion, spending and travel.

Site characteristic models

Another means of deriving estimates of use for recreational facilities has been through the examination of their on-site or physical attributes. In this approach, the characteristics of the site, such as the number of chairlifts or the size of a lake, are the variables that are considered in the analysis.

A study utilizing this method was implemented in the Adirondack Mountains of New York (Shafer and Thompson, 1968). Forty physical site characteristics of 24 campgrounds were measured. This data was subjected to factor analysis and multiple regression to determine which of the variables played a significant role in explaining variation in camper use. The analysis resulted in an equation that contained four site variables that explained 96 percent of the variation in use of these campgrounds over the 5 years of 1959-63. The final model developed by multiple regression analysis determined that campground size, land area of developed swimming beach, water area of developed swimming beach and number of islands accessible by motorboat were the important variables. The equation was:

$$Y = 3409 + .01833(X_{16} + X_{19}) + .1757X_{13}^{2} + .0002[(X_{11})\ (X_{13}^{2})]$$

where: Y = total camper visits

X_{11} = number of islands accessible by motorboat

X_{13} = total number of campsites

X_{16} = land area of developed swimming beach

X_{19} = water area of developed swimming beach

Johnston and Elsner (1971) carried out a similar study in California involving ski area use in the Sierra Nevada. It is apparent from their findings that studies dealing with site characteristics of ski areas must consider a whole range of factors which are not present in most wildland recreation situations, such as the preceding campground study. Besides physical site characteristics, management variables such as lift ticket price or advertising expenditures may have an effect on use of ski areas.

In the Johnston and Elsner study, information concerning site characteristics of ski areas was obtained from the Ski Area Operator's Questionnaire in the Herrington study. Multiple regression was employed to examine use at 26 Sierra ski areas for the 1963-64 season. The ten variables which were found to best explain variation in ski area use were : (1) cost of a day lift ticket, (2) total lift capacity, (3) length of season, (4) competing lift capacity within 30 minutes driving time, (5) a dummy variable which reflects competition of other sites, and (6) five dummy variables which group by location the ski sites used in the analyses.

The authors used these dummy variables as locational shifters to group ski areas into regions which they felt had the same qualities. These were employed in lieu of more detailed site specific investigations at each ski area. It is concluded by the authors that additional variables and more complete data are needed. They state:

> The identification and inclusion of site-specific variables would be clearly preferable to the assumption necessary for including locational shifters--namely, that all ski areas included in the same dummy classification are subject to common and identical factors affecting skier-day visitations beyond those introduced explicitly in a model. (Johnston and Elsner, 1971, p. 48)

One of the most extensive studies of ski area use was carried out by Echelberger and Shafer (1970). This study examined 16 variables measuring on-site facilities, management practices and distances from metropolitan centers of 26 New England ski areas. Two consecutive seasons, 1964-65 and 1965-66, were considered. Factor analysis was employed to examine the interrelationships among the variables. Following this, multiple regression was used to determine which variables were important in explaining variation in use.

For the 1964-65 season, the following equation was found to explain 83 percent of the variation in total skier use:

$$Y = 14.84 + .1006X_{10} + 14.48X_{16} + .1150X_{15}^{2} - .5068X_{15}X_{16}$$

where: Y = total skier days

X_{10} = total advertising budget (dollars)

X_{15} = percent of advertising budget spent on broad coverage advertising (radio, television and magazines)

X_{16} = percent of advertising spent on brochures and leaflets

For the 1965-66 season, the following equation explained 71 percent of the variation in total use:

$$Y = -4517 + 1649X_3 - 72.23X_3X_{11} - 13.59X_3X_{14} - 185.1X_{11}^2 + 3.108X_{11}X_{12} + 19.64X_{11}X_{14}$$

where: Y = total skier days

X_3 = miles of intermediate trails

X_{11} = average of the sum of the driving time (hours) from Boston, Hartford, New York and Albany

X_{12} = number of instructors

X_{14} = percent of slopes rolled and/or packed

The following equation explained 89 percent of the variation in use of the ski areas for the average of both seasons:

$$Y = -1681 + .3095X_{10} + 781.6X_{11} - .0030X_{10}X_{15} - 83.79X_{11}^2$$

where: Y = total skier days

X_{10} = average total advertising budget (dollars)

X_{11} = the average of the sum of driving time (hours) from Boston, Hartford, New York and Albany

X_{15} = average percent of advertising budget spent on broad coverage advertising (radio, television and magazines)

The authors attribute the difference in included variables between the two seasons to snow conditions. The 1964-65 season was a poor snow year while the 1965-66 season was a good snow year.

This study points out several weaknesses of attempts to statistically model recreational use. First, the same problem with inverse relationships that the Herrington study encountered is evident here also. One will notice that each equation contains negative coefficients on variables that would logically be expected to have positive correlations with use. For example, each equation has an advertising variable that is negatively correlated with use whereas one would expect use to increase at higher levels of advertising.

Secondly, the variables included in this model were not sufficient to explain variation in use by themselves. The authors include second order parameters (nonlinear) in the equations (Draper and Smith, 1968). While this type of parameter allowed the authors to report high degress of variation explained by their equations, it does little to help understand the factors affecting ski area use. For example, a significant term in the equation for the 1965-66 season is $- 72.23X_3X_{11}$. This is the product of miles of intermediate trails and average driving time in hours from Boston, Hartford, New York and Albany. Such an expression is essentially meaningless to a ski area operator or land manager who is trying to make intelligent decisions based on research findings.

Finally, I do not feel that the use of factor analysis is appropriate in a situation such as this. To validly utilize this procedure, the population from which the data is drawn must be normally distributed (Harmon, 1967). In the instance of these ski area variables, it is not clear if this assumption was satisfied. Another problem in utilizing factor analysis is that the resulting

factors are constructs of a very hypothetical nature. This has led to the frequent misuse of the technique and erroneous conclusions through the arbitrary assignment of names to factors representing data which in reality is completely random (Rodgers, 1973).

Summary and Evaluation of Use Estimation Techniques

Four major techniques for estimating use of developed recreation sites were discussed in this chapter. Linear projection attempts to estimate use through extrapolation from past use patterns. The major weakness with this approach is that it does not account for changes in tastes and preferences of users. It can only perpetuate existing types of facilities, regardless of whether these facilities meet recreational needs in the proper amount and location.

Another major category considered was economic and gravity models. Economic analyses attempt to develop a demand curve based on the costs incurred in recreational activities. This demand curve indicates optimal facility supply levels at various prices. Gravity models develop estimates of recreational use based on mathematical relationships between facilities and distances to population centers. Economic analyses have a weakness similar to the linear projection technique. Demand curves do not necessarily reflect valid recreational preferences. They can only measure consumption in terms of available opportunities. Gravity models have been used with some success to provide use estimates for small groups of similar facilities, e.g., boating

lakes. They are much less effective in estimating recreational use of large regions with diverse facilities.

The third major category of techniques dealt with user characteristic models. These studies examine socio-economic variables of a population. An attempt is then made to relate activity types and participation rates to broad social aggregates. This approach has several shortcomings. It fails to account for broad cultural differences which affect recreational preferences and does not reflect changes in participation due to innovations and fads. This technique is an attempt to impose static quantifications on phenomena which is extremely dynamic. On the value of this approach, Shafer and Moeller state: "r^2 values resulting from [user characteristic] prediction models generally are much lower than for supply-oriented [site characteristic] prediction models." (Shafer and Moeller, 1971, p. 11)

The fourth major category dealt with site characteristics. This approach attempts to relate physical site characteristics of recreation facilities to use. This approach does not encounter the problems associated with user characteristic models. Site characteristics are much less likely to change than socio-economic variables. However, a major limitation of site characteristic studies is that the predictions of use are contingent upon the existence of demand for that recreational experience.

Approach Used in This Study

Shafer and Moeller (1971) conclude that the most promising approach to estimating recreational use may be an analysis which considers site characteristics, distance or gravity variables and socio-economic variables together. In the case of estimating use at ski areas, especially those which receive a large portion of their use from tourists representing many different regions, the inclusion of socio-economic variables is not feasible. Shafer and Moeller state that the inclusion of socio-economic variables may be most beneficial when the users come from a specific urban-suburban area.

Based on the studies and articles reviewed here, it is apparent that certain factors have repeatedly been found to influence use of recreational facilities. The underlying commonality of these factors is that they are all supply variables. As such they describe characteristics of the recreation site. Included in this consideration of site characteristics are not only physical attributes of the site, but also variables which describe its location and management programs.

This study is an attempt to examine these variables which describe recreation facilities in relation to use of the facilities. In this instance the recreational facilities considered were ski areas in the Wasatch Mountains of Utah.

CHAPTER III

METHODOLOGY

Introduction

Ski area use in the Wasatch Mountains of Utah has increased rapidly over the last 2 decades. Public and private organizations must have information that delineates factors which affect use of these areas. This would facilitate planning and management of facilities and programs to effectively meet this growing need.

The basic approach utilized in this study was developed from examinations of past endeavors in the field of recreational use estimation. From this review it became apparent that the most promising approach to this problem was one which examined the relationships between ski area use and site characteristics of these areas.

Description of Study Area

The ski areas considered in this study are all located in the Wasatch Mountains of northern Utah. The general location of this range is shown on the Location Map in Figure 1.

The Wasatch Range forms an escarpment along the eastern side of the Salt Lake Valley. The range trends in a north-south direction and contains peaks of almost 12,000 feet in elevation. The steep canyons which disect the

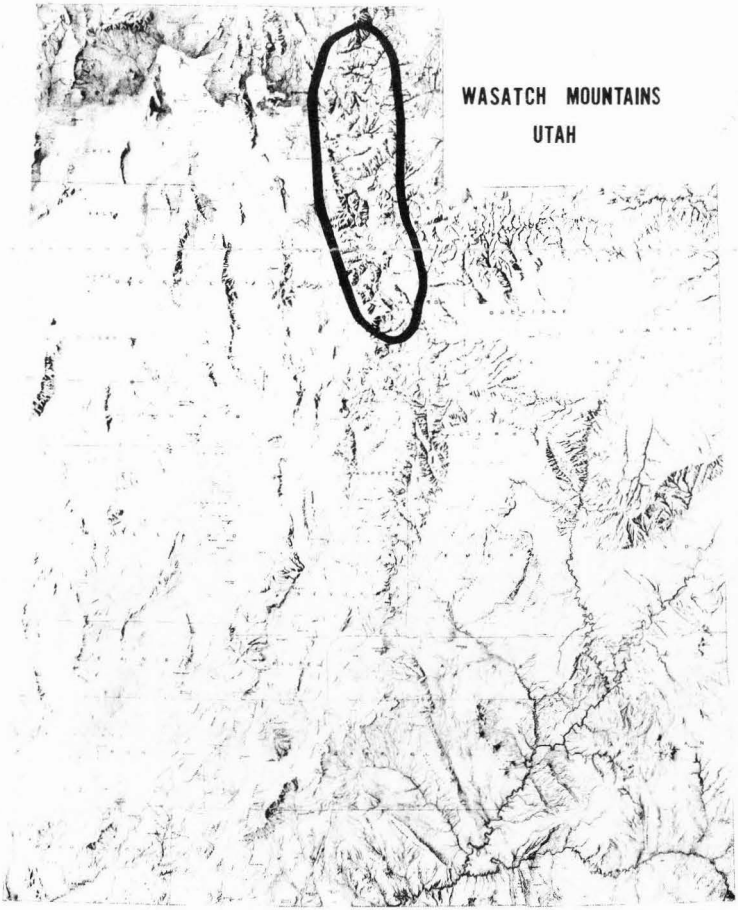


Figure 1. Location map of the Wasatch Mountains.

escarpment provide access to the higher elevations. McKay (1970) reports that this range lies in an area of extremely heavy snowfall which he labels a "snowbelt."

Ski areas included

Studies conducted by the Institute for the Study of Outdoor Recreation and Tourism at Utah State University have revealed two major categories of ski areas in Utah (Hunt, 1974). These are "Wasatch Front Resident" ski areas and "Nonresident" ski areas. A total of six Utah ski areas were included in this study; with three in each category.

The areas included in the "Nonresident" ski area category were:

1. Alta: located 29 miles southeast of Salt Lake City on State Highway 210. This area is in Little Cottonwood Canyon at an elevation of 8550 feet (see vicinity map in Figure 2).
2. Snowbird: located on State Highway 210, 28 miles southeast of Salt Lake City. This area is also in Little Cottonwood Canyon at an elevation of 8100 feet (see vicinity map in Figure 2).
3. Park City: located 31 miles east of Salt Lake City off Interstate 80. This area is in Summit County at an elevation of 7000 feet (see vicinity map in Figure 2).

The areas included in the "Wasatch Front Resident" ski area category were:

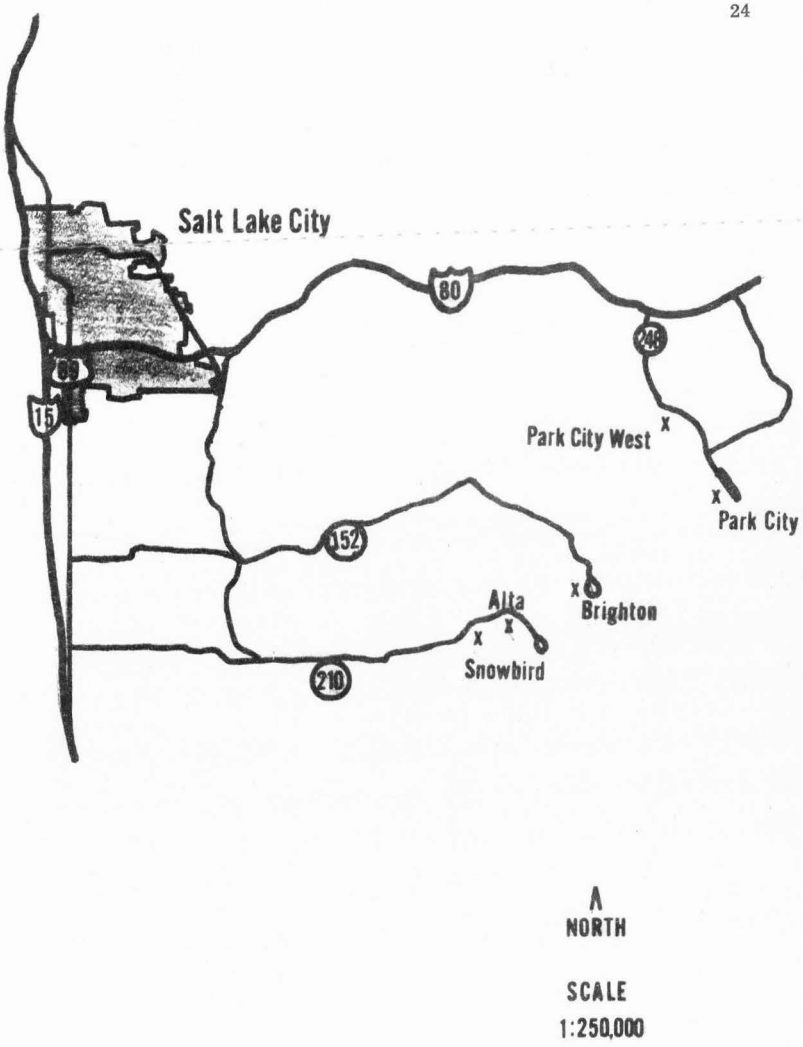


Figure 2. Vicinity map.

4. Park City West: located 28 miles east of Salt Lake City off Interstate 80. This area is also located in Summit County at an elevation of 7000 feet (see vicinity map in Figure 2).
5. Brighton: located 28 miles east of Salt Lake City on State Highway 152. This area is in Big Cottonwood Canyon at an elevation of 8730 feet (see vicinity map in Figure 2).
6. Powder Mountain: located 17 miles northeast of Ogden on State Highway 39. This area is on the slopes of James Peak on the Cache and Weber County line at an elevation of 8000 feet (see vicinity map in Figure 3).

Data Collection Procedure

As originally designed this study attempted to collect information on the following variables for all six ski areas for the 1972-73 and 1974-75 ski seasons:

1. Total skier visits
2. Vertical drop
3. Total number of chairlifts and aerial tramways
4. Total VTF/hr
5. Lift ticket price
6. Average snow depth
7. Percent of total skiable area considered beginner ski terrain
8. Percent of total skiable area considered intermediate ski terrain

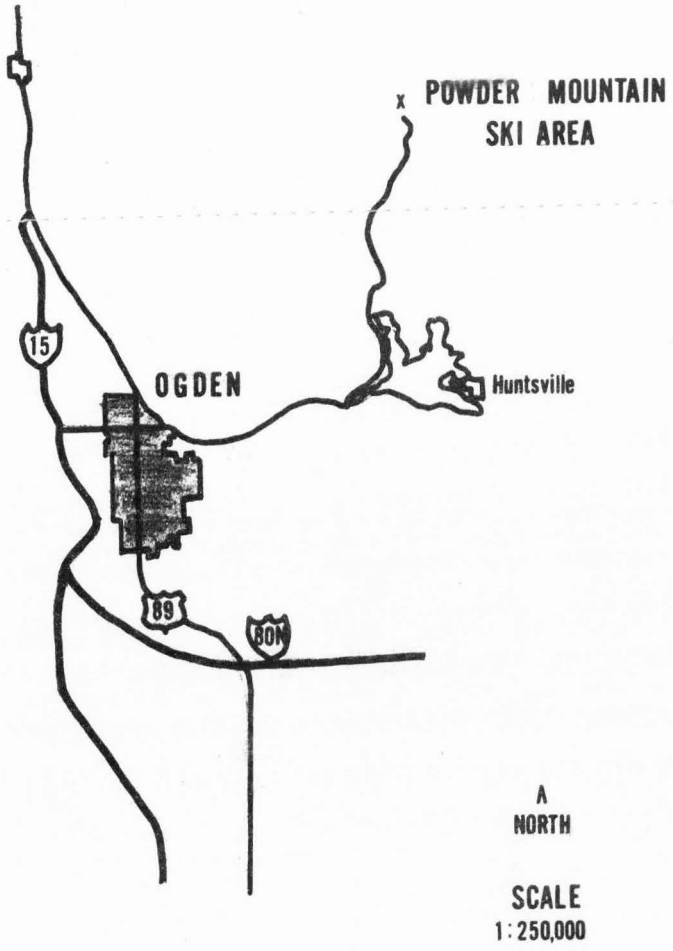


Figure 3. Vicinity map

9. Percent of total skiable area considered expert ski terrain
10. Length of season
11. Number of years in operation
12. Total advertising expenditures related to skiing
13. In-state advertising expenditures related to skiing
14. Out-of-state advertising expenditures related to skiing
15. Distance from Wasatch Front population centers
16. Distance from Salt Lake City International Airport
17. Competing lift capacity within 30 minutes driving time
18. On-site lodging
19. Off-site lodging between 10-30 minutes driving time
20. Off-site lodging between 30-45 minutes driving time
21. Number of certified ski instructors

Much of the data used in this study was available from secondary sources. However, many of these sources were incomplete. This necessitated in-person or telephone interviews to acquire needed information. The use of interviews also allowed for verification of the data collected from other sources.

The first sources consulted for needed information were the Utah Winter Sports Surveys of 1972-73 and 1974-75. These studies were conducted for the Utah Department of Developmental Services by the Institute for the Study of Outdoor Recreation and Tourism at Utah State University. The main objectives of these studies were to determine resident and nonresident skier numbers,

expenditure patterns, length of stay, and a description of the winter sports facilities and accommodations in Utah.

The information in the ski studies was developed by several methods. On-site interviewing at Utah ski areas provided lift line interview data concerning skier residence, party size, transportation type, anticipated length of stay and other information. More detailed diary questionnaires were distributed in ski area parking lots and accommodations. Respondents were asked to record information concerning their expenditures, accommodations and transportation; in addition to the same questions asked in lift line interviews.

A resort facility inventory was also developed by means of a ski area operator's questionnaire. In this questionnaire ski area managers were asked for information concerning the number and kind of facilities at their areas. They were also asked to provide certain information about their capital expenditures and total skier visits.

The Utah Winter Sports Surveys provided the data on total skier visits for the 1972-73 and 1974-75 ski seasons, as well as skier visit figures for individual ski areas used in this thesis. Other information furnished partially or entirely by these ski surveys was:

1. Vertical drop
2. Total number of chairlifts and tramways
3. Total VTF/hr
4. Lift ticket price
5. Length of operating season

6. Number of years in operation
7. Number of certified ski instructors

The Utah Travel Council, which is a division of the Utah Department of Developmental Services, served as another source of information for this study. Through tourism promotional literature made available by the Travel Council, the following data was compiled:

1. Distance between ski areas and major Wasatch Front population centers (Utah Ski Association, 1972-73, 1974-75)
2. Distance between ski areas and Salt Lake City International Airport (Utah Ski Association, 1972-73, 1974-75)
3. Competing lift capacity within 30 minutes of each ski area (Utah Ski Association, 1972-73, 1974-75)
4. On-site lodging within 10 minutes of each ski area (Utah Innkeepers Association, 1973, 1975)
5. Off-site lodging between 10-30 minutes driving time from each ski area (Utah Innkeepers Association, 1973, 1975)
6. Off-site lodging between 30-45 minutes driving time from each ski area (Utah Innkeepers Association, 1973, 1975)

Personal interviews with the ski area managers were utilized to complete the needed data. In the cases of Park City West and Powder Mountain, personal interviews were not possible due to time constraints on the part of the managers. For these two areas, a telephone interview was substituted. The following information was provided by these methods:

1. Percent of total skiable area considered beginner ski terrain
2. Percent of total skiable area considered intermediate ski terrain
3. Percent of total skiable area considered expert ski terrain
4. In-state advertising expenditures related to skiing
5. Out-of-state advertising expenditures related to skiing
6. Total advertising expenditures related to skiing

In addition to these variables all managers were asked to review the data concerning all variables at their respective ski areas. This provided a cross-check on the data compiled from the Utah Winter Sports Surveys and Travel Council information.

Limitations of the data collection procedure

Although the data was collected cautiously and cross-checked wherever possible to ensure accuracy, the nature of the subject being considered makes inaccuracies inherent. Ski areas in Utah are run with varying degrees of administrative sophistication. This had a direct effect on the reliability of the information which they provided. For example, one of the major Utah ski areas included in this study reported total skier visits for the 1974-75 season was 303,563. Another major Utah ski area included in this study reported total skier visits was 300,000 for the same season. While there was no empirical evidence to prove one figure more accurate than the other, the even figure suggests rounding or estimation was involved while the other figure suggests that more accurate records were kept of attendance.

The total VTF/hr figures calculated for each ski area and for the competing VTF/hr did not include rope tows, T-bars or other minor surface conveyances. The nature of these devices made it difficult to determine their actual operating capacity. However, such conveyances accounted for an extremely small percentage of all lifts at the ski areas considered in this study.

The three variables which measured lodging at increasing distances from the ski areas did not represent total lodging units available in every instance. The on-site lodging figures were the most accurate. They represented all lodging units available for rent during the ski season within 10 minutes driving time of each ski area. This information was compiled from numerous sources. These included Utah Travel Council literature, ski area promotional literature, telephone books, records of the Park City Lodging Association, water billing records for the Park City Corporation and on-site investigations.

The figures for off-site lodging between 10-30 minutes and 30-45 minutes were not as exhaustive. It was not felt that the inclusion of every lodging unit in the Salt Lake and Ogden areas was justified as it was unlikely that the older and more obscure hotels and motels served many vacationing skiers. Therefore, the off-site lodging figures represented the number of major lodging units available during the ski season as listed in the promotional literature of the Utah Ski Association and the Utah Innkeepers Association.

This literature, made available by the Travel Council, contained listings of all major hotels, motels and condominiums available to visiting skiers.

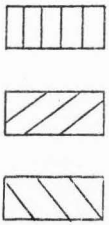
In order to establish driving time zones for the calculation of the lodging variables and competing lift variables, an average driving speed was chosen for each area. Posted speed limits were not felt to be valid indicators of actual travel speeds due to speed reductions associated with mountain driving in the winter months. The average driving speeds utilized in this study were based on the type of road providing access to the ski area and its associated gradient.

Those ski areas which were reached via two lane roads climbing steep canyons were assigned an average driving speed of 35 miles per hour. Ski areas in this category included Alta, Snowbird, Brighton, and Powder Mountain. Those ski areas which were serviced by limited access freeways were assigned an average driving speed of 45 miles per hour. Included in this category were Park City and Park City West. These driving time zones for each ski area are presented graphically in Figures 4, 5, 6 and 7.

The average snow depth figures utilized in this study represented seasonal averages. Snow depth reports for the months of December through April for each ski area during the 1972-73 and 1974-75 ski seasons were obtained from microfilm copies of the Deseret News. The snow depth reported for the fifteenth day of each month was utilized to develop seasonal averages. The specific values are presented in Tables 1 and 2.

Figure 4. Driving time zones for Snowbird and Alta

Key:



0-10 minutes driving time zone from Snowbird and Alta

10-30 minutes driving time zone from Snowbird and Alta

30-45 minutes driving time zone from Snowbird and Alta

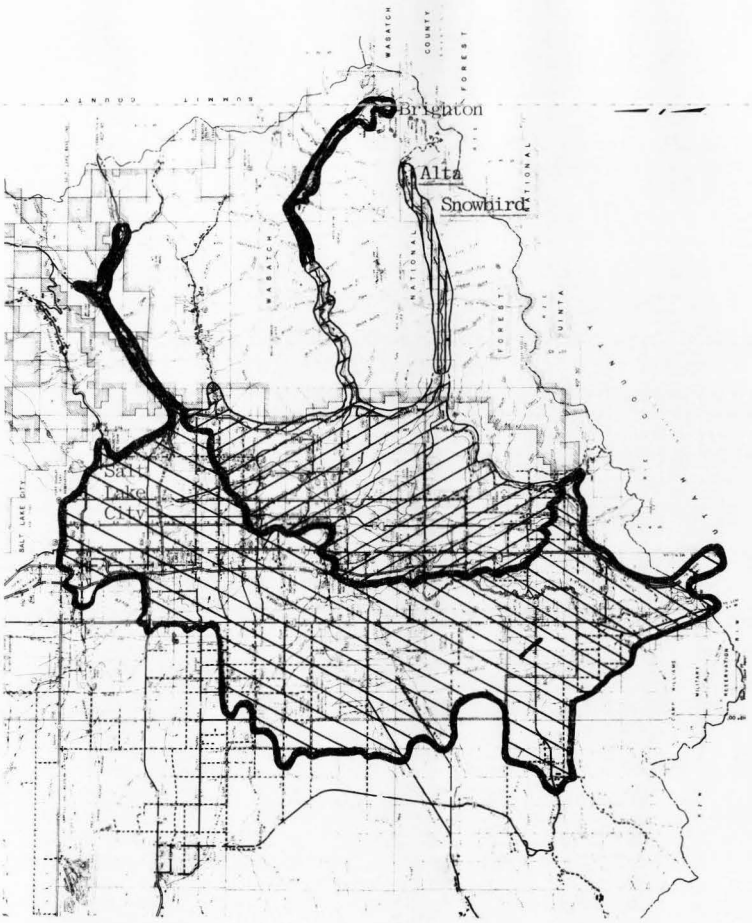
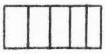

Brighton
Alta
Snowbird
Salt Lake City

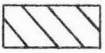
Figure 5. Driving time zones for Brighton

Key:



0-10 minutes driving time zone from Brighton

10-30 minutes driving time zone from Brighton



30-45 minutes driving time zone from Brighton

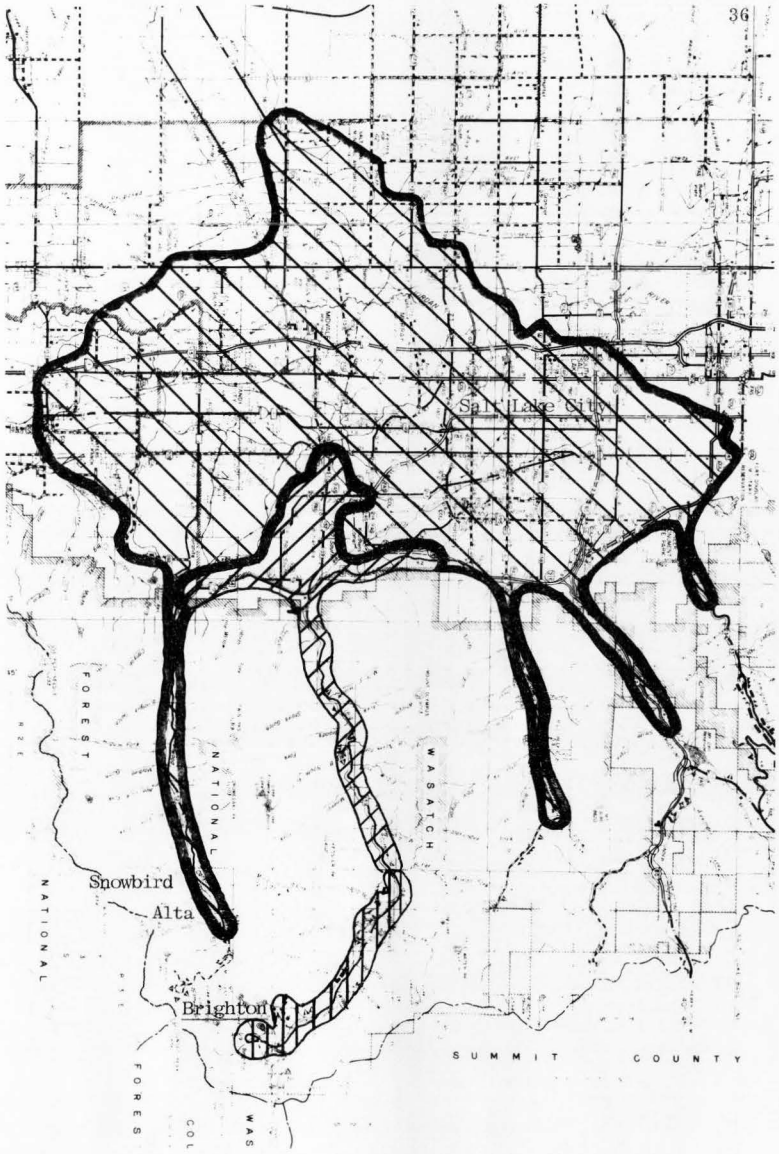
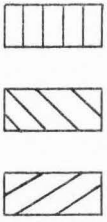

Salt Lake City
FOREST
NATIONAL
WASATCH
Snowbird
Alta
Brighton
SUMMIT
COUNTY

Figure 6. Driving time zones for Park City and Park City West.

Key:



0-10 minutes driving time zone from Park City and Park City West

10-30 minutes driving time zone from Park City and Park City West

30-45 minutes driving time zone from Park City and Park City West

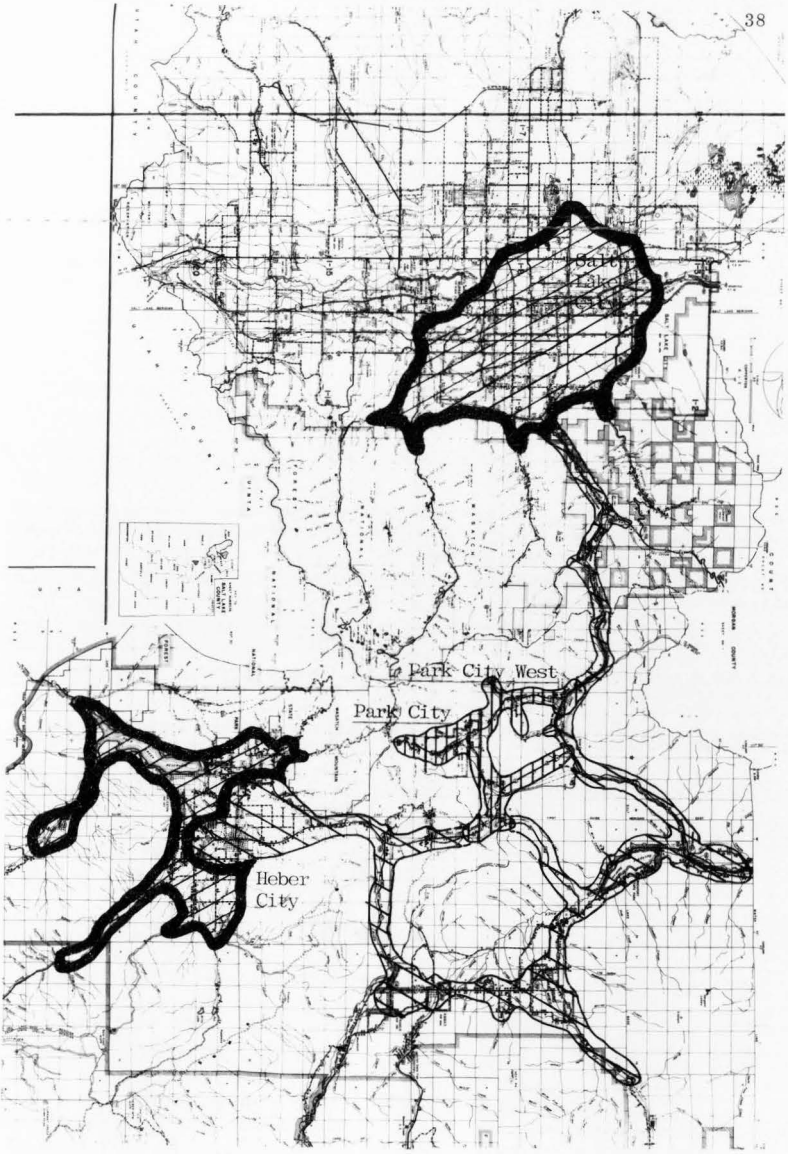
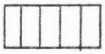

Salt
Lake
City
Park City West
Park City
Heber
City

Figure 7. Driving time zones for Powder Mountain

Key:



0-10 minutes driving time zone from Powder Mountain

10-30 minutes driving time zone from Powder Mountain

30-45 minutes driving time zone from Powder Mountain

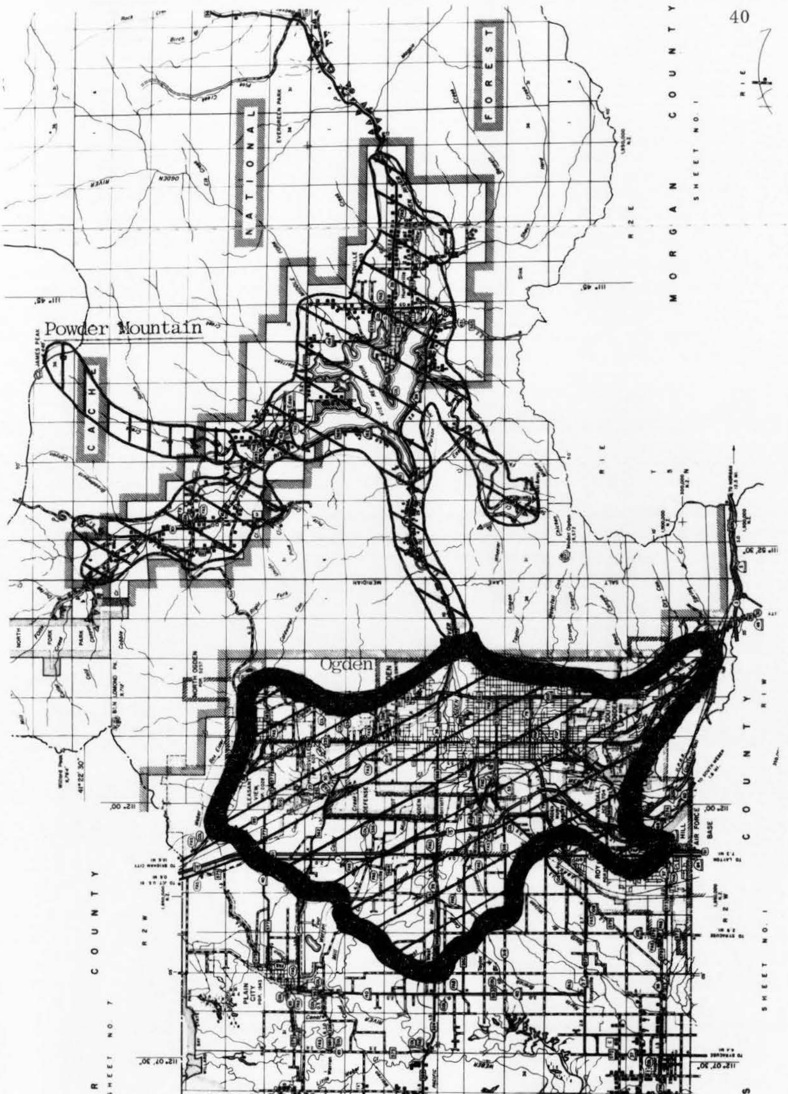

Powder Mountain
Ogden
CACHE
NATIONAL
FOREST
MORGAN COUNTY

TABLE 1.--Snow depth in inches at Utah ski areas on the fifteenth day of each month during the 1972-73 ski season

Ski Area	Dec. 15	Jan. 15	Feb. 15	Mar. 15	Apr. 15
Snowbird	70	73	104	115	96
Alta	54	69	113	129	101
Park City	39	54	90	90	99
Park City West	34	40	86	86	82
Brighton	54	80	93	105	90
Powder Mountain	68	78	115	118	113

SOURCE: Deseret News, Dec. 15, 1972; Jan. 15, 1973; Feb. 15, 1973; Mar. 15, 1973; Apr. 15, 1973.

TABLE 2.--Snow depth in inches at Utah ski areas on the fifteenth day of each month during the 1974-75 ski season

Ski Area	Dec. 15	Jan. 15	Feb. 15	Mar. 15	Apr. 15
Snowbird	35	80	100	117	144
Alta	38	122	105	114	185
Park City	33	64	90	97	118
Park City West	28	65	93	96	115
Brighton	34	102	93	87	173
Powder Mountain	36	97	144	117	164

SOURCE: Deseret News, Dec. 15, 1974; Jan. 15, 1975; Feb. 15, 1975; Mar. 15, 1975; Apr. 15, 1975.

The variables that measured distance from Wasatch Front population centers to each ski area represented gravity variables (Isard, 1974). These variables were calculated by averaging the distance between a given ski area and Salt Lake City, Ogden and Provo. The distance between a given city and ski area was first multiplied by the percentage that city's population was of the total of all three. This provided a means of modifying distance values with proximity to population centers and a means of quantifying the relative importance of a ski area's location. As an example of this procedure the calculations are presented for Alta in Table 3.

TABLE 3.--Calculation procedure for variable measuring distance from Wasatch Front population centers to Alta

	Mileage to Alta	Percent population is of total[a]	Product
Provo	44	20	8.80
Ogden	64	17	10.88
Salt Lake City	29	63	18.27
Value of variable			37.95

SOURCE: Brockert, 1974.

[a]The relative values of these percentages did not change between 1972-73 and 1974-75 ski seasons.

Data Analysis

The analysis of the data was executed in terms of five subgroups. These were:

1. 1972-73 ski season
2. 1974-75 ski season
3. "Nonresident" ski areas
4. "Wasatch Front Resident" ski areas
5. Average of 1972-73 and 1974-75 seasons

Both the 1972-73 and 1974-75 seasons consisted of observations at six Utah ski areas. These included Alta, Snowbird, Park City, Park City West, Brighton and Powder Mountain. The "Nonresident" and "Wasatch Front Resident" ski area subgroups each consisted of observations at three Utah ski areas over two ski seasons. The fifth subgroup consisted of the average of two seasons of observations at the six aforementioned ski areas.

The data was coded and punched on computer cards to allow computer analysis on the Burroughs 6700 computer at the Utah State University Computer Center. The statistical analyses employed in this study were subprograms of the Statistical Package for the Social Sciences (SPSS) computer program (Nie et al., 1975).

Multiple regression

Multiple regression analysis was selected as the main statistical manipulation in this study. It is apparent from the studies reviewed here that

this technique has frequently been employed in research examining use of recreational facilities. Multiple regression was selected due to its ability to describe relationships between dependent and independent variables. Concerning the utility of this technique, Draper and Smith state:

> One can often obtain a linear predictive model which, though it may be in some senses unrealistic, at least produces the main features of the behavior of the response under study. These predictive models are very useful and under certain conditions can lead to real insight into the processes or problem. It is in the construction of this type of predictive model that multiple regression techniques have their greatest contribution to make. These problems are usually referred to as problems with "messy data"--that is, data in which much intercorrelation exists. The predictive model is not necessarily functional and need not be useful for control purposes. This, of course, does not make it useless . . . If nothing else, it can and does provide guidelines for further experimentation, it pinpoints important variables, and is a very useful variable screening device. (Draper and Smith, 1968, p. 235)

While this technique is extremely useful for analyzing relationships, it is not without limitation. The results of regression analysis must be critically examined by those who are familiar with the subject under consideration to verify the congruence of the findings with logical expectations. Specific problems and limitations related to the application of regression to this study are discussed in Chapter V.

The SPSS subprogram REGRESSION was the particular regression procedure utilized in this study. It is a forward stepwise procedure. This procedure first develops a correlation matrix for all variables. The independent variable most highly correlated with the dependent variable is entered in the regression equation. The second independent variable is selected in a similar fashion.

The next operation distinguishes this procedure from other regression techniques. After the second variable has been entered in the equation, it is examined to determine what its contribution to explained variation would have been had it been entered first and the first variable entered second. This procedure is repeated as additional variables are included in the equation.

The main advantage of this technique is the ability to detect variables which are superfluous in explaining variation in the dependent variable. A variable that was closely associated with the dependent variable at earlier stages of the analysis may become unimportant due to its relationship with other variables subsequently included in the equation (Draper and Smith, 1968).

Nie et al. (1975) specify four assumptions related to significance tests associated with multiple regression. These are: (1) the sample is drawn at random, (2) each array of Y for a given combination of X's follows the normal distribution, (3) the regression of Y and X's is linear, and (4) all the Y arrays have the same variance. Regression analysis also entails several assumptions about errors. Specifically, the error components are assumed to be independent, to have a mean of zero, and to have the same variance throughout the range of Y values.

The assumption concerning randomness of the sample was irrelevant to this study as the sample was the same as the population. The other assumptions are best examined for violations by direct inspection of residuals (Nie et al., 1975). Abnormalities in the assumptions are detected by an examination of the pattern of the plotted residuals.

A scatterplot of the residuals was obtained as part of the REGRESSION output. Standardized residuals were plotted against predicted standardized dependent variables. A straight band pattern of residuals along the X axis (predicted standardized dependent variable) was obtained in this study. This is indicative of a "relative freedom from abnormalities" (Nie et al., 1975, p. 342). This cannot be construed as conclusive proof that all assumptions had been satisfied. It only implies that there is no reason to assume that the underlying assumptions have been violated, based on the data considered (Draper and Smith, 1968).

There were three parameters which had to be specified in the SPSS regression design statement. The first parameter specified the maximum number of independent variables that would be included in the final regression equation. In this study no restriction was placed on the number of independent variables eligible for inclusion in the regression equation.

The second parameter related to the F value which was calculated for a test of significance of the regression coefficients. In this study the SPSS default value of F = .01 was utilized. This meant that the F value of a variable had to exceed .01 for inclusion in the regression equation (Nie et al., 1975).

The third parameter was tolerance. Tolerance of a variable is the proportion of variance explained by that variable which is not explained by other variables already in the regression equation (Nie et al., 1975). The SPSS default value of T = .001 was utilized in this study. This allowed for the

inclusion of variables whose proportion of variance not explained by variables already in the equation exceeded .1 percent.

It was not felt that the use of these extremely liberal values adversely affected the results. The objective of this analysis was to delineate variables associated with skier use and not to utilize the results as predictive tools. Accordingly, the inclusion of additional variables in the equations aided in the examination of these associations. Several other parameters also provided an indication of the relative importance of each variable included in the regression equation. These included R square values, standardized regression coefficients and partial correlation analysis.

Partial correlation

Due to the high degree of correlation between the dependent variable and a few independent variables indicated by the regression analyses, partial correlation analysis was employed. Partial correlation is a means of examining the relationship between two variables while statistically controlling the effect of other intervening variables (Nie et al., 1975). Spurious or multicollinear relationships within the regression equations were examined in this manner.

The SPSS subprogram PARTIAL CORR was utilized to implement this analysis. The basic equation used in the calculation of the partial correlation coefficients was:

$$r_{ij.k} = \frac{r_{ij} - (r_{ik})\,(r_{jk})}{\sqrt{1 - r_{ik}^2}\sqrt{1 - r_{jk}^2}}$$

where:

k = variable controlled for

i = dependent variable

j = independent variable

This procedure accomplished the removal of the linear effect of the variable controlled for. This effect was removed from both the dependent and independent variables. The partial correlation coefficient was derived by calculating the Pearson correlation coefficient between these modified variables (Nie et al., 1975). Underlying this procedure was the assumption that the effect of the controlled variable was linear. This assumption was satisfied by employing this technique only were multiple regression analysis indicated linearity between variables.

Variables analyzed

The five dependent variables included in the analyses were:

Y_1 = Total skier visits to all areas studied for the 1972-73 ski season

Y_2 = Total skier visits to all areas studied for the 1974-75 ski season

Y_3 = Average of total skier visits to all areas for the 1972-73 and 1974-75 ski seasons

Y_4 = Total skier visits to "Nonresident" ski areas during the 1972-73 and 1974-75 ski seasons

Y_5 = Total skier visits to "Wasatch Front Resident" ski areas during the 1972-73 and 1974-75 ski seasons

The following independent variables were analyzed to determine their possible relationship to each of the preceding dependent variables:

1. Site characteristic variables

   X_1 = Vertical drop at each ski area

   X_2 = Total number of chairlifts and aerial tramways at each ski area

   X_3 = Total VTF/hr at each ski area

   X_4 = Average snow depth at each ski area

   X_5 = Competing lift capacity within 30 minutes driving time of each ski area

   X_6 = Off-site lodging between 10-30 minutes driving time of each ski area

   X_7 = Off-site lodging between 30-45 minutes driving time of each ski area

2. Management variables

   X_8 = Lift ticket price at each ski area

   X_9 = Length of season at each ski area

   X_{10} = Number of years in operation at each ski area

   X_{11} = Total advertising expenditures related to skiing at each ski area

   X_{12} = On-site lodging at each ski area

3. Locational variables

X_{13} = Distance from Wasatch Front population centers to each ski area

X_{14} = Distance from Salt Lake International Airport to each ski area

As is apparent from the independent variable list, several variables that were included in the data collection procedure were not included in the analyses. The variables that measured percentage of ski area terrain in terms of skiing difficulty had to be omitted due to a lack of available information. Personal interviews with the ski area managers determined that this type of classification was essentially meaningless for Utah ski areas. The main reasons for this were the lack of well defined runs and trails due to sparse vegetation in many areas, and the extreme variability in terrain.

Variables that measured in-state and out-of-state skiing related advertising expenditures also had to be omitted. This was due to the fact that some ski areas did not break down their advertising budget into these categories. Only variables for which values could be compiled for all cases (six ski areas over two seasons) were included in the analyses. This was necessary to avoid limitations in the explanatory power of the models due to small numbers of observations (Draper and Smith, 1968).

The variable which measured the number of certified ski instructors at each ski area was also omitted. The difficulty was not related to missing values but arose from the lack of real meaning in this variable. Any

relationship between the number of ski instructors at a ski area and the use that area received would necessarily be spurious. Accordingly, number of instructors is not a true management variable.

CHAPTER IV

RESULTS

Introduction

The results presented here are organized according to the five different subgroups which were analyzed in this study. The results of the ski season analysis, including the 1972-73 ski season, 1974-75 ski season and the average of both seasons, are presented first. The ski area analysis results, composed of "Nonresident" and "Wasatch Front Resident" ski areas, are subsequently presented.

For each subgroup analyzed, the format utilized for presentation of results is the same. A tabulation of the mean and range values for the variables considered is included first. Following this are the regression analysis results and the results of the partial correlation analysis.

Ski Season Analysis

1972-73 season

The values presented in Table 4 were compiled for the variables during the 1972-73 ski season. The figures are based on all six ski areas included in this study.

TABLE 4.--Mean and range values for selected variables at Utah ski areas during the 1972-73 ski season

Variable	Mean	Range
Total skier visits	166,333	50,000 to 298,300
Vertical drop (feet)	1,954	600 to 3,100
Total number of chairlifts and aerial tramways	4.5	1 to 8
Total VTF/hr	4,490,408	720,000 to 8,747,200
Lift ticket price (dollars)	6.25	5.00 to 7.50
Average snow depth (inches)	84.5	66 to 98
Length of season (days)	157	100 to 190
Number of years in operation	15	1 to 37
Total advertising budget (dollars)	66,484	4,000 to 200,000
Distance from Wasatch Front population centers (miles)	42.5	36 to 55
Distance from Salt Lake City International Airport (miles)	38.3	31 to 67
Competing lift capacity within 30 minutes driving time (VTF/hr)	5,083,408	2,608,000 to 8,747,200
On-site lodging (units)	384	0 to 698
Off-site lodging between 10-30 minutes driving time (units)	109	0 to 187
Off-site lodging between 30-45 minutes driving time (units)	3,379	901 to 4,677

Multiple regression analysis was implemented on this data and the following equation was developed for the 1972-73 ski season:

$$Y_1 = -592449.7 + 40737.8\ X_2 + 5176.8\ X_3 + 143.9\ X_{12} + 524.8\ X_9$$

where:

Y_1 = Total skier visits to six Utah ski areas during the 1972-73 ski season

and:

X_2 = Total number of chairlifts and aerial tramways

X_3 = Average snow depth

X_{12} = On-site lodging

X_9 = Length of season

These four variables were determined to explain 100 percent of the variation observed in total skier visits to six Utah ski areas during the 1972-73 ski season. The standard error of estimate for this equation was 126. This implied that skier visit figures predicted by this equation would deviate from actual skier visits by an average of 126 skier visits, based on the 1972-73 data.

The results of the regression analysis are summarized in Table 5. The variables are listed in the order in which they were entered in the regression equation. The beta values listed in the far right column of Table 5 are the standardized regression coefficients. They provided an opportunity for comparing the relative influence of each variable on the dependent variable, when the independent variables were not measured in directly comparable units, e.g., miles, dollars, feet, VTF/hr, etc. This is achieved by examining the

regression coefficients in terms of standard deviation units. For example, the beta value for total lifts (X_2) was .8875. This indicated that one standard deviation unit change in total lifts would cause the greatest increase in skier visits (.8857 of one standard deviation).

TABLE 5.--Correlation coefficients and standardized regression coefficients for the 1972-73 ski season

Variable	R square	R sq. change	Beta
X_2 : total lifts	.7636	.7636	.8857
X_3 : average snow depth	.9785	.2148	.5930
X_{12}: on-site lodging	.9987	.0202	.4105
X_9 : length of season	1.0000	.0013	.0521

The SPSS version of partial correlation analysis was also employed. This was necessary due to the large amount of variation in skier visits accounted for by the first variable in each regression equation. Partial correlation provided a means of examining the importance (in terms of variation in skier visits) of the variables entered in the regression equation on subsequent steps while removing the influence of variables entered previously in the equation. For example, the 1972-73 regression equation included four variables: X_2, X_3, X_{12}, and X_9. The R square between Y_1 (skier visits) and X_2 is .7636. The R square increases to .9785 when X_3 is included in the equation with X_2. The inclusion of X_3 in the regression equation only increased the

R square by .2148. However, when partial correlation was employed to remove the influence of the first variable (X_2), the R square between Y_1 and the second variable (X_3) increased to .9084. Thus it is apparent that the regression results must be closely scrutinized to reveal such subtle relationships.

In this study, each of the variables included in the regression equations were subjected to partial correlation with the dependent variable (skier visits). For each variable considered, all variables which preceded it in the regression equation were controlled for. Due to the small number of observations in this study, the restricted degrees of freedom allowed for only one variable to be controlled at a time. This meant the second variable in the regression equation required only one partial (controlling for the first), the third variable required two partials (controlling for the first, then the second variable) and so forth until all variables in the equation had been examined. This format was utilized in each instance where partial correlation was used. The results of the partial correlation analysis on the 1972-73 season regression results are presented in Table 6.

TABLE 6.--First order partial correlation coefficients for variables included in the 1972-73 regression equation

Variables correlated with Y_1[a]	Variable controlled for	Partial correlation coefficients	R square
X_3	X_2	.9534	.9084
X_{12}	X_2	-.335	.1112
X_{12}	X_3	.7053	.4974
X_9	X_2	.5363	.2876
X_9	X_3	.1020	.0104
X_9	X_{12}	.9215	.8492

[a]where:

Y_1 = Total skier visits to six Utah ski areas during the 1972-73 ski season

and

X_2 = Total number of chairlifts and aerial tramways

X_3 = Average snow depth

X_{12} = On-site lodging

X_9 = Length of season

1974-75 season

The data in Table 7 was collected for the variables for the 1974-75 ski season. The figures were based on all six ski areas included in this study.

This data was also subjected to multiple regression analysis. The following equation was obtained:

$$Y_2 = - 536528.2 + 48219.5\ X_2 + 3955.5\ X_4 + 53.1\ X_1 - .1378\ X_{11}$$

TABLE 7.--Mean and range values for selected variables at Utah ski areas during the 1974-75 ski season

Variable	Mean	Range
Total skier visits	182,068	60,149 to 303,563
Vertical drop (feet)	2,049	1,172 to 3,100
Total number of chairlifts and aerial tramways	5	2 to 9
Total VTF/hr	5,487,233	2,520,000 to 11,005,900
Lift ticket price (dollars)	7.00	5.00 to 8.50
Average snow depth (inches)	96	79 to 113
Length of season (days)	156	120 to 190
Number of years in operation	17	3 to 38
Total advertising budget (dollars)	85,000	5,000 to 300,000
Distance from Wasatch Front population centers (miles)	42.5	36 to 55
Distance from Salt Lake City International Airport (miles)	38.3	31 to 67
Competing lift capacity within 30 minutes driving time (VTF/hr)	5,478,900	0 to 11,005,900
On-site lodging (units)	646	30 to 1,126
Off-site lodging between 10-30 minutes driving time (units)	109	0 to 187
Off-site lodging between 30-45 minutes driving time (units)	3,900	901 to 5,425

where:

Y_2 = Total skier visits to six Utah ski areas during the 1974-75 ski season

and:

X_2 = Total number of chairlifts and aerial tramways

X_4 = Average snow depth

X_1 = Vertical drop

X_{11} = Total advertising budget

According to the results of the regression analysis, the four variables in this equation account for 99.9 percent of the variation in skier visits to the six Utah ski areas during the 1974-75 ski season. According to the standard error of estimate obtained from this analysis, the quantity of skier visits predicted by this equation deviated from the actual quantity by an average of 952 skier visits during the season. The results of this regression analysis are presented in Table 8. The variables are listed in the order in which they were entered in the equation.

TABLE 8.--Correlation coefficients and standardized regression coefficients for the 1974-75 ski season

Variable	R square	R sq. change	Beta
X_2 : Total lifts	.7423	.7423	1.0345
X_4 : Average snow depth	.9271	.1848	.5306
X_1 : Vertical drop	.9944	.0673	.3248
X_{11}: Total advertising	.9999	.0056	-.1394

Partial correlation analysis was then employed to examine the interrelationships and interactions among the independent variables. Table 9 presents the partial correlation coefficients calculated for the results of the 1974-75 regression analysis.

TABLE 9.--First order partial correlation coefficients for variables included in the 1974-75 regression equation

Variable correlated with Y_2[a]	Variable controlled for	Partial correlation coefficients	R square
X_4	X_2	.8468	.7170
X_1	X_2	.2428	.0590
X_1	X_4	.6549	.4289
X_{11}	X_2	-.5113	.2614
X_{11}	X_4	.6615	.4376
X_{11}	X_1	.3477	.1209

[a]where:

Y_2 = Total skier visits to six Utah ski areas during the 1974-75 ski season

and:

X_2 = Total number of chairlifts and aerial tramways

X_4 = Average snow depth

X_1 = Vertical drop

X_{11} = Total advertising budget

Both seasons

Table 10 summarizes the information calculated for the average of the two ski seasons. The figures are based on observations at six ski areas for the 1972-73 and 1974-75 ski seasons.

Multiple regression analysis was applied to this data and produced the following equation:

$$Y_3 = -342252.3 + 42914.1X_2 + 2727.9X_4 - 5.0232X_1 - 188.8X_{12} + 47.6X_7$$

where:

Y_3 = Total skier visits to six Utah ski areas for the average of the 1972-73 and 1974-75 ski seasons

and:

X_2 = Total number of chairlifts and aerial tramways

X_4 = Average snow depth

X_1 = Vertical drop

X_{12} = On-site lodging

X_7 = Off-site lodging between 30-45 minutes driving time

The regression analysis determined that these five variables accounted for 96.4 percent of the variation in skier visits to six Utah ski areas for the average season of the 1972-73 and 1974-75 ski seasons. The standard error of estimate associated with this equation was 26,697. This implied that skier visit figures obtained by this equation deviated an average 26,697 skier visits from the actual figures. Table 11 summarizes the correlation coefficients and

TABLE 10.--Mean and range values of selected variables for the average of the 1972-73 and 1974-75 ski seasons

Variable	Mean	Range
Total skier visits	174,200	50,000 to 303,563
Vertical drop (feet)	2,001	600 to 3,100
Total number of chairlifts and aerial tramways	4.75	1 to 9
Total VTF/hr	4,988,820	720,000 to 11,005,900
Lift ticket price (dollars)	6.62	5.00 to 8.50
Average snow depth (inches)	90.3	66 to 113
Length of season (days)	157	100 to 190
Number of years in operation	16.3	1 to 39
Total advertising budget (dollars)	75,742	4,000 to 300,000
Distance from Wasatch Front population centers (miles)	42.5	36 to 55
Distance from Salt Lake City International Airport (miles)	38.3	31 to 67
Competing lift capacity within 30 minutes driving time (VTF/hr)	5,281,154	0 to 11,005,900
On-site lodging (units)	515	0 to 1,126
Off-site lodging between 10-30 minutes driving time (units)	109	0 to 187
Off-site lodging between 30-45 minutes driving time (units)	3,640	901 to 5,425

standardized regression coefficients for the average season. The variables are listed in the order in which they were included in the regression equation.

TABLE 11.--Correlation coefficients and standardized regression coefficients for the average season

Variable	R square	R sq. change	Beta
X_2 : Total lifts	.7438	.7538	.93007
X_4 : Average snow depth	.8916	.1378	.3753
X_1 : Vertical drop	.9129	.0213	-.0351
X_{12}: On-site lodging	.9218	.0089	-.7579
X_7 : Off-site lodging between 30-45 minutes	.9643	.0425	.8596

Partial correlation coefficients were calculated to examine the interrelationships among the variables in the regression equation. These coefficients for the average of the 1972-73 and 1974-75 ski seasons are presented in Table 12.

TABLE 12.--First order partial correlation coefficients for variables in the average season regression equation

Variables correlated with Y_3[a]	Variable controlled for	Partial correlation coefficient	R square
X_4	X_2	.7481	.5597
X_1	X_2	.1836	.0337
X_1	X_4	.6221	.3870
X_{12}	X_2	-.2612	.0682
X_{12}	X_4	.5530	.3058
X_{12}	X_1	.1710	.0292
X_7	X_2	.0320	.0010
X_7	X_4	.6894	.4753
X_7	X_1	.3138	.0985
X_7	X_{12}	.5392	.2907

[a]where:

Y_3 = Total skier visits to six Utah areas for the average of the 1972-73 and 1974-75 ski seasons

and

X_2 = Total number of chairlifts and aerial tramways

X_4 = Average snow depth

X_1 = Vertical drop

X_{12} = On-site lodging

X_7 = Off-site lodging between 30-45 minutes driving time

Ski Area Analysis

"Nonresident" ski areas

The information presented in Table 13 was compiled for ski areas in the "Nonresident" category. The figures represent data collected for three ski areas during the 1972-73 and 1974-75 ski seasons.

Multiple regression analysis provided the following equation for "Nonresident" ski areas:

$$Y_4 = 718614.8 - 79.5\ X_1 + 22.9\ X_8 - 2346.9\ X_9 + 2389.9\ X_{13}$$

where:

Y_4 = Total skier visits to "Nonresident" ski areas for the ski seasons of 1972-73 and 1974-75

and:

X_1 = Vertical drop

X_8 = Lift ticket price

X_9 = Length of season

X_{13} = Distance from Wasatch Front population centers

According to the results of the regression analysis, the four preceding variables accounted for 96.6 percent of the variation in skier visits to the "Nonresident" ski areas over two seasons. The standard error of estimate figure associated with this equation implied that the number of skier visits predicted by this model deviated an average of 18,591 skier visits from the actual figure. Table 14 contains a summary of the correlation coefficients and

TABLE 13. Mean and range values for selected variables at "Nonresident" ski areas

Variable	Mean	Range
Total skier visits	267,739	194,000 to 303,563
Vertical drop (feet)	2,500	2,000 to 3,100
Total number of chairlifts and aerial tramways	6.3	4 to 9
Total VTF/hr	7,093,975	4,159,250 to 11,005,900
Lift ticket price (dollars)	7.25	5.50 to 8.50
Average snow depth (inches)	91.2	74 to 113
Length of season (days)	154.8	147 to 160
Number of years in operation	17.3	2 to 38
Total advertising budget (dollars)	127,484	14,905 to 300,000
Distance from Wasatch Front population centers (miles)	39.7	36 to 45
Distance from Salt Lake City International Airport (miles)	33	31 to 35
Competing lift capacity within 30 minutes driving time (VTF/hr)	5,262,125	4,159,250 to 6,655,000
On-site lodging (units)	710	439 to 1,126
Off-site lodging between 10-30 minutes driving time (units)	155	140 to 187
Off-site lodging between 30-45 minutes driving time (units)	4,833	4,350 to 5,425

standardized regression coefficients (beta) for this analysis. The variables are listed in which they were included in the equation.

TABLE 14.--Correlation coefficients and standardized regression coefficients for "Nonresident" ski areas

Variable	R square	R sq. change	Beta
X_1 : Vertical drop	.7454	.7454	-.8735
X_8 : Lift ticket price	.9463	.2009	.0546
X_9 : Length of season	.9547	.0084	-.2766
X_{13}: Distance index	.9664	.0117	.2227

Partial correlation analysis was again employed to examine the interrelationships among the variables. The resulting partial correlation coefficients for the "Nonresident" ski areas are presented in Table 15.

"Wasatch Front Resident" ski areas

Table 16 contains a summary of the information compiled on ski areas in the "Wasatch Front Resident" category. The figures were calculated using data from three ski areas for the 1972-73 and 1974-75 ski seasons.

The application of multiple regression analysis to this data resulted in the following equation:

TABLE 15.--First order partial correlation coefficients for variables included in the "Nonresident" regression equation

Variable correlated with Y_4[a]	Variable controlled for	Partial correlation coefficient	R square
X_8	X_1	.8882	.7889
X_9	X_1	-.8593	.7384
X_9	X_8	-.6639	.4408
X_{13}	X_1	.8069	.6511
X_{13}	X_8	.8389	.7038
X_{13}	X_9	.6731	.4531

[a]where:

Y_4 = Total skier visits to "Nonresident" ski areas for the 1972-73 and 1974-75 ski seasons

and:

X_1 = Vertical drop

X_8 = Lift ticket price

X_9 = Length of season

X_{13} = Distance from Wasatch Front population centers

TABLE 16.--Mean and range values for selected variables at "Wasatch Front Resident" ski areas

Variable	Mean	Range
Total skier visits	80,662	50,000 to 125,000
Vertical drop (feet)	1,503	600 to 2,100
Total number of chairlifts and aerial tramways	3.2	1 to 4
Total VTF/hr	2,883,666	720,000 to 4,381,000
Lift ticket price (dollars)	6.00	6.00 to 7.00
Average snow depth (inches)	89.5	66 to 112
Length of season (days)	159.3	100 to 190
Number of years in operation	15.3	1 to 39
Total advertising budget (dollars)	24,000	4,000 to 45,000
Distance from Wasatch Front population centers (miles)	45.3	39 to 55
Distance from Salt Lake City International Airport (miles)	43.6	32 to 67
Competing lift capacity within 30 minutes driving time (VTF/hr)	5,300,183	0 to 11,005,900
On-site lodging (units)	320	0 to 1,126
Off-site lodging between 10-30 minutes driving time (units)	62	0 to 187
Off-site lodging between 30-45 minutes driving time (units)	2,447	901 to 5,425

$$Y_5 = 37489 + 1806.1X_{10} + .5558X_{11} + .0043X_3 - .0019X_5$$

where:

Y_5 = Total skier visits to "Wasatch Front Resident" ski areas

and:

X_{10} = Number of years in operation as a ski area

X_{11} = Total advertising budget

X_3 = Total VTF/hr

X_5 = Competing lift capacity within 30 minutes driving time

The regression analysis determined that these four variables accounted for 99.6 percent of the observed variation in skier visits to three "Wasatch Front Resident" ski areas over the 1972-73 and 1974-75 ski seasons. The standard error of estimate associated with this equation was 4147. Based on this data, the skier visit figure predicted by this equation deviated from the actual amount an average of 4147 skier visits. A summary of the correlation coefficients and standardized regression coefficients for "Wasatch Front Resident" ski areas is contained in Table 17. The variables are listed in the order in which they entered the regression equation.

Partial correlation analysis was also utilized to examine the interrelationships among the variables in the regression equation. Table 18 presents these coefficients for the "Wasatch Front Resident" ski areas.

TABLE 17.--Correlation coefficients and standardized regression coefficients for "Wasatch Front Resident" ski areas

Variable	R square	R sq. change	Beta
X_{10}: Years in operation	.9628	.9628	1.0673
X_{11}: Total advertising	.9859	0230	.3063
X_3 : Total VTF/hr	.9889	.0030	.2001
X_5 : Competing lifts	.9962	.0073	-.2636

TABLE 18.--First order partial correlation coefficients for variables included in the "Wasatch Front Resident" regression equation

Variables correlated with Y_5[a]	Variable controlled for	Partial correlation coefficient	R square
X_{11}	X_{10}	.7871	.6195
X_3	X_{10}	.7754	.6012
X_3	X_{11}	.7404	.5482
X_5	X_{10}	.5363	.2876
X_5	X_{11}	.2627	.0690
X_5	X_3	-.9048	.8187

[a]where:

Y_5 = Total skier visits to "Wasatch Front Resident" ski areas

and

X_{10} = Number of years in operation

X_{11} = Total advertising budget

X_3 = Total VTF/hr

X_5 = Competing lift capacity within 30 minutes

CHAPTER V

DISCUSSION

Introduction

This study was an attempt to delineate variables which were associated with variation in use at selected Utah ski areas. There has been a dramatic increase in skiing participation and ski facilities over the last decade in Utah. In order to plan and manage ski facilities to effectively meet this need, public and private agencies must understand those factors which influence use. Towards understanding this process, data concerning selected variables at six Utah ski areas was collected. Multiple regression was the main statistical technique used to analyze this information.

Applicability and Limitations

It was not the intention of this study to develop generalizations applicable to all western ski areas or even all Utah ski areas. There are several unique characteristics which may have biased the results obtained here. Two of these peculiarities relate to the type of people which utilize Utah ski areas. Utah receives a high percentage of nonresident vacationing skiers (Hunt, 1974), and Utah residents have a greater propensity to participate in recreational activities than the national average (Elmer and Green, 1973). Another unique characteristic of Utah skiing is its close proximity to the densely

populated sections of the state. Herrington (1967) found that only in Alaska is the average distance to ski areas less than in Utah. Table 19 summarizes these findings.

TABLE 19. Average distance of auto travel by residents of 12 western states who skied in western ski areas during the 1964-65 season

State of residence	Average distance to ski area (miles)
Alaska	34
Arizona	238
California	198
Colorado	96
Idaho	78
Montana	106
Nevada	124
New Mexico	118
Oregon	107
Utah	73
Washington	122
Wyoming	133
All States	139

SOURCE: Herrington, 1967.

Such peculiarities limit the applicability of this study to other regions. However, it is felt by the author that the findings are of relevance to Utah ski areas in general for two reasons. First, ski areas that serve mostly resident clientele and those that mostly serve nonresidents were both included in the analysis. Secondly, the six ski areas included in this study accounted for 80 percent of all skier visits to the 13 Utah ski areas which operated during

the 1974-75 season. The conclusions and implications of this study should therefore be fairly representative of a large portion of the Utah ski industry.

The results obtained in this study, as all results obtained from statistical procedures, must be interpreted with caution. Statistical analyses such as regression and correlation must be considered tools which aid in the analysis and interpretation of data (Ostle, 1963). As is the objective of most scientific inquiry, this study examined relationships between variables with the intention of establishing causality among these variables. However, even when the results of statistical analyses show high correlation between two variables, this by itself does not prove that a cause-and-effect relationship exists among the variables (Huff, 1965). In order to derive meaningful conclusions, the results of statistical analyses must be interpreted and evaluated in the context of the particular subject matter field in which the study was performed.

Another word of caution in interpreting these results relates to the number of observations utilized in the study. As previously stated, it was not the intention of this study to develop conclusions that were applicable to any ski area not explicitly analyzed in this study. Accordingly, the sample of six Utah ski areas considered here represents the relevant population for this study. The effects of this assumption on the statistical procedures employed are addressed by Draper and Smith in the statement:

When X_i and Y_i, i = 1, 2, ..., n, are all constants, rather than sample values from some distribution, r_{xy} [correlation coefficient] can still be used as a measure of association. Since the set of values (X_i, Y_i) i = 1, 2, ..., n can be thought of as a complete finite distribution, r_{xy} is, effectively, a population rather than a sample value, that is, $r_{xy} = \rho_{xy}$ [rho] in this case (Draper and Smith, 1968, p. 34).

Ski Season Analysis

1972-73 and 1974-75 ski seasons

This study found that two site characteristic variables, total number of chairlifts and aerial tramways at each ski area, and average snow depth at each ski area; were mainly responsible for variation in ski area use during both the 1972-73 and 1974-75 ski seasons. Concerning implications of the first variable, it is difficult to say whether increases in the number of lifts at these ski areas will cause greater use or vice versa. It is entirely possible that high use at an area will cause the addition of more uphill conveyances.

The importance of the total number of chairlifts and aerial tramways variable must be evaluated in light of several other related variables. As the correlation matrices for the 1972-73 and 1974-75 data indicate (Appendices A and B), this variable was highly correlated with vertical drop and with total VTF/hr. All three of these variables in some way reflected the amount of terrain which was available for skiing at each area. Indeed, the number of

lifts variable may have reflected the quality of skiing at each area in terms of diversity of terrain and crowding related to uphill transport capability.

It is apparent that the number of uphill conveyances played an important role in determining the use that the six Utah ski areas received during the 1972-73 and 1974-75 ski seasons. However, the relationship between ski area use and number of lifts was not a simple, direct one. Before an intelligent decision could be made regarding the expansion of lift capacity at an area, additional information concerning competing lift capacity, potential skier markets and effects on lift ticket price would have to be examined.

Although average snow depth was the second variable entered in the regression equation, partial correlation showed this variable was highly correlated with variation in use when the effects of the first variable (total number of lifts) was controlled for. The meaning of this relationship is more complex than might first seem apparent because the average snow depth figure probably measured several implicit factors related to snow depth.

The amount of powder snow an area received would be such an implicit factor. Utah skiing is well known for the extremely light snow which it receives. It would seem logical to assume that as the average amount of snow received by a ski area increased, so did the likelihood of powder snow. Thus there is the possibility that this variable measured not only the physical quantity of snow received at a ski area but also the quality of the skiing.

Another peculiarity of the average snow depth variable was its inability to reflect the profound influence of snowfall timing on ski area use. The results

of this study indicate that for these two seasons, snow depth and ski area use exhibited a strong positive relationship. This cannot be taken as an indicator that increased amounts of snowpack at ski areas led to greater use.

If the snow was received on a weekend or holiday, when these ski areas received the majority of their use (Hunt, 1974), attendance would be drastically reduced for that period due to hazardous road conditions, avalanche danger and other problems related to inclement weather. Similarly, the distribution of snowfalls over the entire season could have profound effects on the number of skier visits. Obviously, few people will ski if the snowpack is marginal or non-existent. If this is the condition for the Thanksgiving and/or Christmas holidays, when use is normally very heavy, a large reduction in skier visits could result. These particular circumstances did in fact characterize the early part of the 1974-75 ski season. According to ski area managers contacted during the data collection phase, this factor caused a significant reduction in skier visits expected for the 1974-75 season.

In summary, the two variables measuring total number of lifts at each ski area and average snow depth at each ski area were found to explain over 90 percent of the variation in skier visits for both the 1972-73 and 1974-75 ski seasons. Those involved with managing ski areas or planning new ones in the Wasatch Front region may want to evaluate these results and their implications vis-a-vis their particular situation. While the amount of snow received by an area is not a variable that management can significantly alter at present, the findings of this study indicate that a thorough investigation of snow

accumulation patterns at potential ski area sites is warranted. Similarly, extensive consideration must be given to lift capacity at existing and planned ski areas. This variable, however, is much more amenable to management practices. Broad generalizations concerning the nature of this variable's relationship to use are not possible due to its site specific nature and to other variables which are closely related to lift capacity.

Both seasons

It is not surprising that the same two variables that explained most of the variation in skier visits for the individual ski seasons were also the important variables for the average ski season. The number of chairlifts and aerial tramways together with the average snow depth variable accounted for 89 percent of the variation in skier visits. When the effects of the total lifts variable was controlled for, partial correlation analysis determined that average snow depth explained a considerable amount of variation in skier visits (Table 12). Similar results were obtained, when this procedure was implemented on the 1972-73 and 1974-75 results individually. Three other variables were included in the final regression equation. However, their contribution to the explanatory power of the model, in terms of R square, was extremely small.

The findings of the analysis for the average season reiterates the conclusions drawn from the 1972-73 and 1974-75 ski season analyses. The fact that the same two variables were important in all three analyses suggests that closer scrutiny of these variables is warranted. As previously mentioned,

there is a strong possibility that the number of lifts variable and average snow depth variable reflect a combination of quantitative and qualitative factors at each ski area.

Ski Area Analysis

"Nonresident" ski areas

Another objective of this study was to analyze factors related to use at Utah ski areas which received a majority of use from non-Utah residents. The results of the analysis for the "Nonresident" ski areas is somewhat confusing.

Two variables, vertical drop and lift ticket price at each ski area, were determined to explain over 90 percent of the variation in skier visits at the "Nonresident" ski areas. However, the sign on the vertical drop regression coefficient (X_1) was negative. This would contradict the logical expectation that as a ski area increases its skiable terrain, skier visits would also increase.

It is very likely that this variable measured something other than the amount of available ski terrain. There was also a problem with the inability of this variable to reflect the quality of the available skiing. These points are exemplified in the data. Alta, which had the largest skier visit figure of any "Nonresident" ski area, has the smallest vertical drop of areas in this category. An alternative explanation might be that vertical drop was positively associated with use up to some point, and then other factors became important.

Lift ticket price was also important in explaining variation in skier visits for "Nonresident" ski areas. When the effects of vertical drop were controlled for, partial correlation analysis determined that lift ticket price explained about 79 percent of the variation in use. Ostensibly, this positive relationship would contradict the economic dictum of supply and demand: as the price of something rises, the consumption of that thing decreases.

This apparent contradiction can be explained by a closer inspection of the lift ticket price variable in the correlation matrix for "Nonresident" ski areas (Appendix C). The price of a lift ticket exhibited strong correlation with VTF/hr, total advertising budget and number of years in operation. The positive relationship between lift ticket price and VTF/hr is entirely understandable as investments in lifts and their operation and maintenance costs have a direct effect on overhead costs. Similarly, expenditures for advertising will affect the price a ski area must charge for lift tickets. The third variable related to lift ticket price was years in operation. This was a negative relationship indicating that the more recent ski areas charged more for their lift tickets than older ones.

These variables point out an interesting anomaly in the "Nonresident" ski areas. Alta experienced slightly more use than Park City yet Alta had approximately half the lift capacity of Park City (measured in VTF/hr). It is also interesting to note that both Park City and Snowbird expended more on skiing related advertising, yet neither experienced more skier visits than Alta. This is most likely a function of the number of years in operation. A well

established area such as Alta should not require as much promotion through advertising as the more recent areas of Snowbird and Park City require.

In summary, regression analysis and partial correlation determined that vertical drop and lift ticket price were responsible for a large portion of the variation in use of "Nonresident" ski areas (Table 14). The inverse relationship between vertical drop and use necessitated a more in-depth consideration of the implications of these variables. The results imply that managers must give extensive consideration to providing the optimal level of lift facilities at existing and planned ski areas. This should include consideration of the amount of skiable terrain made available by each lift, and each lift's effect on the price that must be charged for a lift ticket.

"Wasatch Front Resident" ski areas

Number of years in operation was determined to be the variable most highly related to variation in use at "Wasatch Front Resident" ski areas. While the importance of this factor cannot be denied, it is hardly a management variable. In order to determine what other variables were important in this category, the effects of the years in operation variable were controlled through partial correlation (Table 18). The results of this analysis indicated that total advertising expenditures and total VTF/hr also accounted for significant amounts of variation in resident ski area use.

Whether or not the inclusion of the advertising variable and the total VTF/hr variable in the regression equation was meaningful is a matter of

speculation. The inclusion of these two variables only increased the explanatory power of the "Wasatch Front Resident" model by about 2 percent.

The difficulties encountered in determining which variables were meaningful in relation to use were probably an effect of the wide variations in the data. Although Hunt (1974) found that all of these areas received the majority of their ski use from residents of the Wasatch Front, there was very little similarity beyond this. An inspection of the range values for these areas (Table 16) will illustrate this point. For example, number of years in operation varied between 1 and 39 years, total skier visits ranged from 50,000 to 125,000 and advertising expenditures ranged from $4,000 to $45,000.

An anomaly, similar to that noted for Alta and Park City in the "Nonresident" category, is apparent in the "Wasatch Front Resident" group. In this instance the anomaly concerns Brighton, which is a ski area similar to Alta in location and number of years in operation; and Park City West, which is similar to Park City in location and number of years in operation. While Brighton experienced much higher skier use than Park City West (approximately 60 percent more), it has far less lift capacity in terms of VTF/hr (approximately 65 percent less). The contrasts between Brighton and Park City West were also similar to those mentioned for Alta-Park City. Park City West (the more recent ski area) spent much more for advertising than Brighton (the older area). Similarly, Park City West also charged more for lift tickets than did Brighton.

In summary, the results of the analyses in the "Wasatch Front Resident" ski area category indicated that three variables accounted for 98 percent of the variation in skier visits. However, one of these variables alone explained all but 2 percent of the variation explained by the three variables. This was attributed to the extreme variability and dissimilarity among the values of the variables for each ski area in this category. The most important finding of this analysis was that ski areas within this group were extremely variable in terms of use, facilities, location and management practices. As such, extensive site specific examinations are necessary for any planning or management endeavors.

Implications

Those charged with administering ski areas or the lands on which they are located should find these results of interest. The apparent importance of number of chairlifts and aerial tramways would probably be of greatest interest to these groups. The fact that two ski areas supported the same amount of skier visits, when one had half as much lift capacity (VTF/hr) as the other, indicates that adequate consideration has not been given to this factor in the past. Considering the high cost of lift facilities to the operator and skier, and their impact on natural and aesthetic resources; this question certainly warrants more extensive consideration.

The anomaly between lift capacity and use implies that broad generalizations concerning ski area use are of limited value. Generalizations concerning

ski area use, as provided by this study, are of greatest utility to those concerned with planning for the provision of skiing opportunities on a regional basis. The U. S. Forest Service and regional planning agencies could best utilize this type of information.

In order to understand ski area use on a site specific basis, there is still no substitute for first hand experience and familiarity with local conditions. There are too many qualitative and intangible values, which defy quantification, to develop meaningful generalizations. For instance, how does one compare and evaluate scenic quality at ski areas, and from what locations? How does a ski area's image affect use? How do these types of factors affect the quality of the skiing experience?

Such subjective questions have been considered in several campground studies. Studies concerning campground use in recent years have stressed that there is no "average camper." Instead, campers have been found to represent a diversity of groups with expectations that differ greatly concerning what a camping experience is.

Similarly, future studies in the field of ski area use must recognize that skiers represent many different groups looking for a variety of experiences. Ski area use might be more easily studied and understood if more precise classifications of ski areas types could be developed. Such a classification system should consider the type of skiers using an area. Possible distinctions could be based on skier proficiency, residency, length of stay, mode of transportation to site, and number and relation of people in skiing party. This kind

of understanding of the various types of ski areas would provide a conceptual basis from which to apply more meaningful analyses to the diverse phenomena of ski area use.

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APPENDICES

Appendix A: Correlation Coefficient Matrix for 1972-73 Ski Season

FILE STUDYA (CREATION DATE = 08/29/75)
SUBFILE DATA72

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010	VAR011	VAR012	VAR013
VAR002	1.00000	0.57785	0.07386	0.74319	0.42679	0.01643	0.08777	0.32218	0.59901	-0.42240	-0.47165	-0.65572
VAR003	0.57785	1.00000	0.50257	0.84604	0.63929	-0.31505	-0.36654	-0.10838	0.00761	-0.75063	-0.77350	0.16001
VAR004	0.07386	0.50257	1.00000	0.42414	0.34957	-0.45293	-0.19776	0.34682	0.50272	-0.45154	-0.65488	0.12176
VAR005	0.74319	0.84604	0.42414	1.00000	0.78861	-0.45216	-0.34140	-0.17775	0.08535	-0.41450	-0.63174	0.10303
VAR006	0.42679	0.63929	0.34957	0.78861	1.00000	-0.12878	-0.20823	-0.87210	0.42359	-0.03700	-0.25270	-0.06073
VAR007	0.01643	-0.31505	-0.45293	-0.45216	-0.12878	1.00000	0.73950	0.16427	-0.29750	0.15047	0.05703	-0.49757
VAR008	0.08777	-0.36654	-0.19776	-0.34140	-0.20823	0.73950	1.00000	0.36347	-0.09424	0.19053	0.03304	-0.40649
VAR009	0.32218	-0.10838	0.34682	-0.17775	-0.87210	0.16427	0.36347	1.00000	-0.44918	0.09213	-0.05542	-0.47196
VAR010	0.59901	0.00761	0.50272	0.08535	0.42359	-0.29750	-0.09424	-0.44918	1.00000	-0.03543	-0.20995	-0.18941
VAR011	-0.42240	-0.75063	-0.45154	-0.41450	-0.03700	0.15047	0.19053	0.09213	-0.03543	1.00000	0.64137	0.10744
VAR012	-0.47165	-0.77350	-0.65488	-0.63174	-0.25270	0.05703	0.03304	-0.05542	-0.20995	0.64137	1.00000	0.22780
VAR013	-0.65572	0.16001	0.12176	0.10303	-0.06073	-0.49757	-0.40649	-0.47196	-0.18941	-0.10744	-0.22780	1.00000
VAR014	0.49331	0.71071	0.69747	0.51174	0.34855	-0.05980	-0.10223	-0.24356	0.58902	-0.32500	-0.57705	0.05660
VAR015	0.56592	0.75652	0.65708	0.61503	0.55477	-0.59209	-0.47344	-0.42528	0.55925	-0.43865	-0.56341	0.05824
VAR016	0.61026	0.82721	0.70274	0.61734	0.54269	-0.49930	-0.40786	-0.44135	0.52609	-0.52310	-0.65444	0.01706

	VAR014	VAR015	VAR016
VAR002	0.49331	0.56592	0.61026
VAR003	0.71071	0.75652	0.82721
VAR004	0.69747	0.65708	0.70274
VAR005	0.61174	0.61503	0.61734
VAR006	0.34855	0.55477	0.54269
VAR007	-0.05980	-0.59209	-0.49930
VAR008	-0.10223	-0.47344	-0.40786
VAR009	-0.24356	-0.42528	-0.44135
VAR010	0.58902	0.55925	0.52609
VAR011	-0.32500	-0.43865	-0.52310
VAR012	-0.57705	-0.56341	-0.65444
VAR013	0.05660	0.05824	0.01706
VAR014	1.00000	0.85929	0.95372
VAR015	0.85929	1.00000	0.94426
VAR016	0.95372	0.94426	1.00000

Where:

VAR002 = Skier visits
VAR003 = Vertical drop
VAR004 = Number of lifts
VAR005 = VTF/hr
VAR006 = Lift price
VAR007 = Average snow depth
VAR008 = Length of season
VAR009 = Years in operation
VAR010 = Total advertising
VAR011 = Distance from Wasatch Front
VAR012 = Distance from SLC Airport
VAR013 = Competing lifts
VAR014 = On-site lodging
VAR015 = Off-site lodging within 30 min.
VAR016 = Off-site lodging within 45 min.

Correlation coefficients for 1972-73 ski season

Appendix B: Correlation Coefficient Matrix for 1974-75 Ski Season

UTAH SKI AREA USE 08/29/75 PAGE 4

FILE STUDY4 (CREATION DATE = 08/29/75)
SUBFILE DATA4

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
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	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010	VAR011	VAR012	VAR013
VAR002	1.00000	0.58344	0.85156	0.77971	0.41190	-0.01127	-0.17840	0.42396	0.58700	-0.48238	-0.44347	-0.13285
VAR003	0.58344	1.00000	0.55830	0.67228	0.64133	-0.48465	-0.56529	-0.20035	0.06180	-0.56328	-0.53104	-0.68943
VAR004	0.85156	0.55830	1.00000	0.93470	0.51755	-0.05642	-0.32766	0.17644	0.50289	-0.38230	-0.35107	-0.26243
VAR005	0.77971	0.67228	0.93470	1.00000	0.76691	-0.33674	-0.43261	-0.16123	0.43827	-0.10767	-0.09636	-0.42158
VAR006	0.41190	0.64133	0.51755	0.76691	1.00000	-0.41383	-0.58484	-0.71543	0.27396	0.15461	0.03472	-0.39996
VAR007	-0.01127	-0.48465	-0.05642	-0.33674	-0.41383	1.00000	0.64709	0.34155	-0.09772	0.17446	0.20163	-0.26289
VAR008	-0.17840	-0.56529	-0.32766	-0.43261	-0.58484	0.64709	1.00000	0.47092	-0.36239	0.15197	0.18647	-0.06911
VAR009	0.42396	-0.20035	0.17644	-0.16123	-0.71543	0.34155	0.47092	1.00000	-0.55842	-0.44218	-0.40154	-0.48855
VAR010	0.58700	0.06180	0.50289	0.43827	0.27396	-0.09772	-0.36239	-0.55842	1.00000	0.09493	0.13643	-0.06848
VAR011	-0.48238	-0.56328	-0.38230	-0.10767	0.15461	0.17446	0.15197	0.09493	1.00000	0.91757	0.82558	0.06819
VAR012	-0.44347	-0.53104	-0.35107	-0.09636	0.03472	0.20163	0.18647	-0.15643	0.91757	1.00000	0.90258	0.06819
VAR013	-0.13285	0.68943	-0.26243	-0.42158	-0.39996	-0.26289	-0.06911	-0.48855	-0.06848	0.06819	0.06819	1.00000
VAR014	0.49839	0.70458	0.53155	0.61790	0.40364	-0.06853	-0.24994	0.09900	-0.35257	-0.27144	-0.24144	0.04144
VAR015	0.53158	0.73955	0.60692	0.72924	0.55603	-0.06493	-0.24994	0.09900	-0.35257	-0.27144	-0.24144	0.04144
VAR016	0.51790	0.80364	0.58686	0.70578	0.59685	-0.03561	-0.20268	0.13229	-0.47194	-0.53479	-0.49155	0.37962

	VAR014	VAR015	VAR016
VAR002	0.49839	0.53158	0.51790
VAR003	0.70458	0.73955	0.80364
VAR004	0.53155	0.60692	0.58686
VAR005	0.72924	0.72657	0.70578
VAR006	0.55763	0.55763	0.59685
VAR007	-0.06853	-0.06493	-0.03561
VAR008	-0.24994	-0.24994	-0.20268
VAR009	0.09900	0.09900	0.13229
VAR010	-0.35257	-0.35257	-0.47194
VAR011	-0.27144	-0.27144	-0.53479
VAR012	-0.24144	-0.24144	-0.49155
VAR013	0.04144	0.04144	0.37962
VAR014	1.00000	0.89758	0.76717
VAR015	0.89758	1.00000	0.96137
VAR016	0.76717	0.96137	1.00000

Where:

VAR002 = Skier visits
VAR003 = Vertical drop
VAR004 = Number of lifts
VAR005 = VTF/hr
VAR006 = Lift price
VAR007 = Average snow depth
VAR008 = Length of season
VAR009 = Years in operation
VAR010 = Total advertising
VAR011 = Distance from Wasatch Front
VAR012 = Distance from SLC Airport
VAR013 = Competing lifts
VAR014 = On-site lodging
VAR015 = Off-site lodging within 30 min.
VAR016 = Off-site lodging within 45 min.

Correlation coefficients for 1974-75 ski season

Appendix C: Correlation Coefficient Matrix for "Nonresident" Ski Areas

UTAH SKI AREA USE

FILE STUDYA (CREATION DATE = 08/29/75)
SCRIPTILE NAMES

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CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
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	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010	VAR011	VAR012	VAR013
VAR002	1.00000	-0.86336	0.61285	0.64987	-0.19567	-0.69302	-0.28480	0.43665	0.16918	0.69140	0.05936	0.43086
VAR003	-0.86336	1.00000	-0.44611	0.18355	0.62985	-0.18403	-0.20288	-0.41028	0.27729	-0.36105	-0.62602	-0.60447
VAR004	0.61288	-0.44611	1.00000	0.73013	0.29729	-0.58238	-0.57013	0.12455	0.69807	0.95721	0.93077	-0.22835
VAR005	0.24987	0.18555	0.73013	1.00000	0.54576	-0.69770	-0.76360	-0.26038	0.47987	0.79845	0.80894	-0.75349
VAR006	-0.19567	0.62985	0.29729	0.54576	1.00000	-0.47400	-0.77535	-0.80003	0.63494	0.37123	0.10214	-0.47162
VAR007	-0.69302	-0.18403	-0.58238	-0.69770	-0.47400	1.00000	0.35179	0.54171	-0.79237	-0.72642	-0.53492	0.75400
VAR008	-0.28480	-0.20288	-0.57013	-0.76360	-0.77535	0.35179	1.00000	0.37744	-0.71106	-0.64116	-0.33484	0.52120
VAR009	0.43665	-0.41028	0.12455	-0.26038	-0.80003	0.54171	0.37744	1.00000	-0.61641	-0.56193	-0.62423	0.65429
VAR010	0.16918	0.27729	0.69807	0.47987	0.63494	-0.79237	-0.71106	-0.61641	1.00000	0.73270	0.53479	-0.53117
VAR011	0.69140	-0.36105	0.95721	0.79845	0.37123	-0.72642	-0.64116	-0.56193	0.73270	1.00000	0.75466	-0.44140
VAR012	0.05936	-0.62602	0.93077	0.80894	0.10214	-0.53492	-0.33484	-0.62423	0.53479	0.75466	1.00000	-0.17014
VAR013	0.43086	-0.60447	-0.22835	-0.75349	-0.47162	0.75400	0.52120	0.65429	-0.53117	-0.44140	-0.17014	1.00000
VAR014	0.50494	-0.09440	0.70796	0.76720	0.68305	-0.14216	-0.41016	-0.10394	0.69611	0.56319	0.62559	-0.14529
VAR015	0.53643	-0.15554	0.90139	0.68254	0.53594	-0.81165	-0.55555	-0.26158	0.66160	0.87716	0.80833	-0.60472
VAR016	0.43032	-0.05427	0.52681	0.59075	0.59453	-0.05275	-0.87492	-0.03555	0.45478	0.37244	0.53001	-0.01773

	VAR014	VAR015	VAR016
VAR002	0.50494	0.53648	0.43032
VAR003	-0.09440	-0.15554	-0.05427
VAR004	0.70796	0.90139	0.52681
VAR005	0.76720	0.68254	0.59075
VAR006	0.68305	0.53594	0.59453
VAR007	-0.14216	-0.81165	-0.05275
VAR008	-0.41016	-0.55555	-0.87492
VAR009	-0.10394	-0.26158	-0.03555
VAR010	0.69611	0.66160	0.45478
VAR011	0.56319	0.87716	0.37244
VAR012	0.62559	0.80833	0.53001
VAR013	-0.14529	-0.60472	-0.01773
VAR014	1.00000	0.69611	0.45478
VAR015	0.69611	1.00000	0.37244
VAR016	0.45478	0.37244	1.00000

Where:

VAR002 = Skier visits
VAR003 = Vertical drop
VAR004 = Number of lifts
VAR005 = VTF/hr
VAR006 = Lift price
VAR007 = Average snow depth
VAR008 = Length of season
VAR009 = Years in operation
VAR010 = Total advertising
VAR011 = Distance from Wasatch Front
VAR012 = Distance from SLC Airport
VAR013 = Competing lifts
VAR014 = On-site lodging
VAR015 = Off-site lodging within 30 min.
VAR016 = Offsite lodging within 45 min.

Correlation coefficients for "Nonresident" ski areas

Appendix D: Correlation Coefficient Matrix for "Wasatch Front Resident" Ski Areas

FILE STUDYA (CREATION DATE = 08/29/75)
SUBFILE WASPES

CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010	VAR011	VAR012	VAR013
VAR002	1.00000	0.26464	0.66886	0.12902	-0.75584	-0.02743	0.82355	0.48173	-0.76004	-0.77852	-0.62630	-0.61488
VAR003	0.26464	1.00000	0.88689	0.97455	0.08671	-0.75349	-0.72892	0.13590	0.44701	-0.74834	-0.82571	0.55242
VAR004	0.66886	0.88689	1.00000	0.78990	-0.33686	-0.84715	-0.86665	0.37542	-0.22800	-0.95910	-0.97184	0.13251
VAR005	0.12902	0.97455	0.78990	1.00000	0.25928	-0.65996	-0.78404	-0.02685	0.38317	-0.58493	-0.70893	0.30269
VAR006	-0.75584	0.08671	-0.33686	0.25928	1.00000	0.12277	-0.45009	-0.23662	0.70283	0.55355	0.42364	0.76389
VAR007	-0.02743	-0.75349	-0.84715	-0.65996	0.12277	1.00000	0.76405	0.08297	-0.11615	0.63174	0.67344	-0.24479
VAR008	0.82355	-0.72892	-0.86665	-0.78404	-0.45009	0.76405	1.00000	0.52886	-0.67365	0.72650	0.68937	-0.08530
VAR009	0.48123	0.13590	0.37542	-0.02685	-0.23662	0.08297	0.52886	1.00000	-0.67065	0.21767	0.28548	-0.67172
VAR010	-0.76004	0.44701	-0.22800	0.38317	0.70283	-0.11615	-0.67365	-0.67065	1.00000	0.23821	0.22830	0.39556
VAR011	-0.77852	-0.74834	-0.95910	-0.58493	0.55355	0.63174	0.72650	0.21767	0.23821	1.00000	0.94532	0.05798
VAR012	-0.62630	-0.82571	-0.97184	-0.70893	0.42364	0.67344	0.68937	0.28548	0.22830	0.94532	1.00000	-0.11145
VAR013	-0.61488	0.55242	0.13251	0.30269	0.76389	-0.24479	-0.08530	-0.67172	0.39556	0.05798	-0.11145	1.00000
VAR014	-0.23480	0.78868	0.48526	0.84554	0.56440	-0.84715	-0.86665	-0.36868	0.66182	-0.38215	-0.49475	0.08827
VAR015	-0.29115	0.80685	0.48554	0.84002	0.56746	-0.84002	-0.86746	-0.36868	0.66182	-0.38946	-0.50000	0.07912
VAR016	-0.17366	0.85008	0.56460	0.86746	0.38006	-0.77933	-0.93056	-0.30118	0.50367	-0.43856	-0.58844	0.84355

Where:

VAR002 = Skier visits
VAR003 = Vertical drop
VAR004 = Number of lifts
VAR005 = VTF/hr
VAR006 = Lift price
VAR007 = Average snow depth
VAR008 = Length of season
VAR009 = Years in operation
VAR010 = Total advertising
VAR011 = Distance from Wasatch Front
VAR012 = Distance from SLC Airport
VAR013 = Competing lifts
VAR014 = On-site lodging
VAR015 = Off-site lodging within 30 min.
VAR016 = Off-site lodging within 45 min.

Correlation coefficients for "Wasatch Front Resident" ski areas

Appendix E: Correlation Coefficient Matrix for the Average of the 1972-73 and 1974-75 Ski Seasons

UTAH SKI AREA USE

FILE STUDYA (CREATION DATE = 08/29/75)
SUBFILE DATA72 DATA74

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CORRELATION COEFFICIENTS

A VALUE OF 99.00000 IS PRINTED
IF A COEFFICIENT CANNOT BE COMPUTED.

	VAR002	VAR003	VAR004	VAR005	VAR006	VAR007	VAR008	VAR009	VAR010	VAR011	VAR012	VAR013
VAR002	1.00000	0.57833	0.66821	0.75942	0.41822	0.03530	-0.01136	0.42626	0.55852	-0.05132	-0.04216	-0.09465
VAR003	0.57833	1.00000	0.58667	0.75451	0.61268	-0.31742	-0.45630	-0.17844	0.53340	-0.70007	-0.72403	0.20140
VAR004	0.66821	0.58667	1.00000	0.68455	0.44985	-0.35887	-0.29085	0.20351	0.71402	-0.39406	-0.40300	0.01125
VAR005	0.75942	0.75451	0.68455	1.00000	0.77868	-0.36873	-0.37474	-0.15419	0.70413	-0.29511	-0.40746	0.07430
VAR006	0.41822	0.61268	0.44985	0.77868	1.00000	-0.10733	-0.26546	-0.02687	0.42638	0.07515	-0.02494	0.22923
VAR007	0.03530	-0.31742	-0.35887	-0.36873	-0.10733	1.00000	0.80536	0.22787	-0.37740	0.19227	0.43450	-0.47521
VAR008	-0.01136	-0.45630	-0.29085	-0.37474	-0.26546	0.80536	1.00000	0.41855	-0.20426	0.13746	0.38277	-0.22910
VAR009	0.42626	-0.17844	0.20351	-0.15419	-0.02687	0.22787	0.41855	1.00000	-0.38673	0.46187	0.44999	-0.45017
VAR010	0.55852	0.53340	0.71402	0.70413	0.42638	-0.37740	-0.20426	-0.38673	1.00000	-0.39021	-0.47430	0.08140
VAR011	-0.05132	-0.70007	-0.39406	-0.29511	0.07515	0.19227	0.13746	0.46187	-0.39021	1.00000	0.91787	-0.08485
VAR012	-0.04816	-0.72163	-0.40300	-0.40746	-0.02494	0.43450	0.38277	0.44999	-0.47430	0.91787	1.00000	-0.08841
VAR013	-0.09465	0.20140	0.01125	0.07430	0.22923	-0.47521	-0.22910	-0.45017	0.08140	-0.08485	-0.08841	1.00000
VAR014	0.48196	0.65007	0.56643	0.75146	0.65555	-0.43801	-0.76556	-0.20586	0.55509	-0.31893	-0.52687	0.03233
VAR015	0.53696	0.73979	0.67940	0.75883	0.57859	-0.55140	-0.82297	-0.23478	0.53944	-0.38869	-0.52341	0.02958
VAR016	0.61560	0.79718	0.69591	0.75423	0.58456	-0.40510	-0.74465	-0.12485	0.49092	-0.52171	-0.49636	0.00934

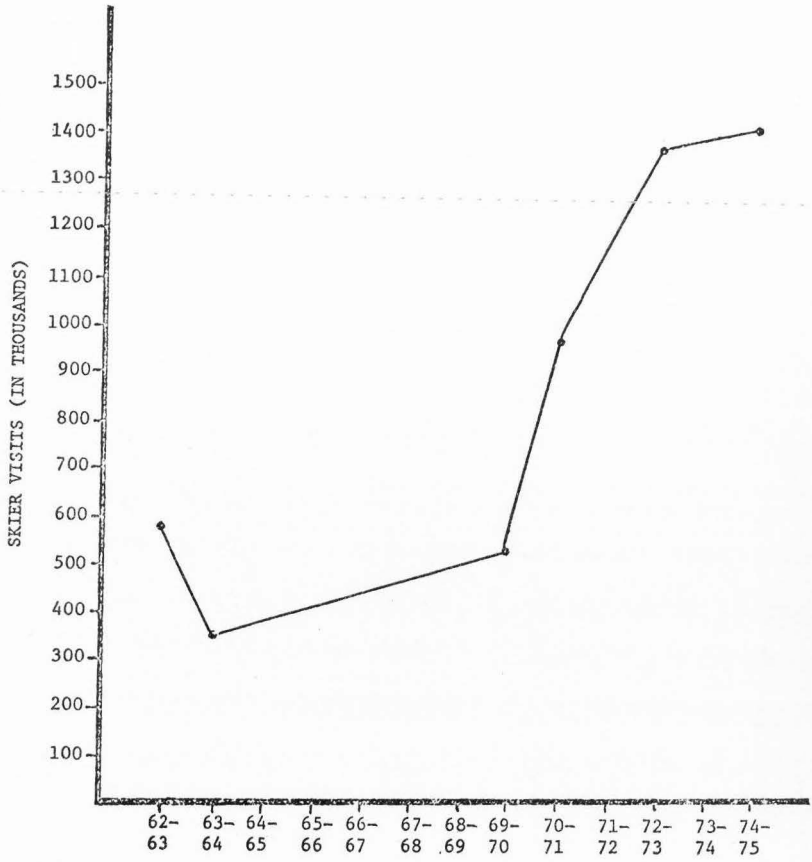
	VAR014	VAR015	VAR016
VAR002	0.48196	0.53696	0.61560
VAR003	0.65007	0.73979	0.79718
VAR004	0.56643	0.67940	0.69591
VAR005	0.75146	0.75883	0.75423
VAR006	0.65555	0.57859	0.58456
VAR007	-0.43801	-0.55140	-0.40510
VAR008	-0.76556	-0.82297	-0.74465
VAR009	-0.20586	-0.23478	-0.12485
VAR010	0.55509	0.53944	0.49092
VAR011	-0.31893	-0.38869	-0.52171
VAR012	-0.52687	-0.52341	-0.49636
VAR013	0.03233	0.02958	0.00934
VAR014	1.00000	0.91838	0.93130
VAR015	0.91838	1.00000	0.96837
VAR016	0.93130	0.96837	1.00000

Where:

VAR002 = Skier visits
VAR003 = Vertical drop
VAR004 = Number of lifts
VAR005 = VTF/hr
VAR006 = Lift price
VAR007 = Average snow depth
VAR008 = Lenth of season
VAR009 = Years in operation
VAR010 = Total advertising
VAR011 = Distance from Wasatch Front
VAR012 = Distance from SLC Airport
VAR013 = Competing lifts
VAR014 = On-site lodging
VAR015 = Off-site lodging within 30 min.
VAR016 = Off-site lodging within 45 min.

Correlation coefficients for the average of 1972-73 and 1974-75 ski seasons

Appendix F: Growth of Skiing in Utah



Growth of Skiing in Utah[a]

[a]Source: Anderson and Hunt (1975)

Appendix G: Glossary

Beta coefficient: A standardized regression coefficient associated with a regression equation; allows for comparison of the relative effects of independent variables on the dependent variable when independent variables are measured in different units (e.g., miles and dollars).

Dummy variables: Artificial variables created by the researcher to allow the inclusion of nominal-scale variables in the regression equation.

Gravity model: A mathematical expression describing the movement of people over space by considering population and distance variables.

Multicollinearity: A condition in which two or more of the independent variables are highly intercorrelated.

"Nonresident" ski areas: Those Utah ski areas at which over 50 percent of the annual total skier visits are by nonresidents of Utah, as reported by Hunt (1974).

Partial correlation coefficient: A simple correlation coefficient between the residuals of the dependent variable (Y) and a given independent variable (X_1), were the effects of a second independent variable (X_2) have been removed from both Y and X_1. In such a situation, X_2 is termed "the variable controlled for."

Partial regression coefficient: Constant, unstandardized values associated with each independent variable in the regression equation.

Pearson correlation coefficient: "A measure of association indicating the strength of the linear relationship between two variables." (Nie et al., 1975, p. 279)

R square: A measure of the proportion of variance in one variable which is explained by another; calculated by squaring the Pearson correlation coefficient.

Residual: Prediction error of the regression equation, the difference between the observed value of Y and the Y value generated by the regression equation.

Scatterplot: Component of SPSS REGRESSION subprogram output in which residuals are plotted against predicted Y values.

Skier visit: One person engaged in skiing at a developed ski area for one day or any fraction thereof.

Standard error of estimate: Measures the accuracy of the predicted value of the regression equation; the average error in Y predictions.

Standardized regression coefficients: See Beta coefficients.

Variance: A measure of variability in a variable based on the dispersion of a set of observations around the mean of those observations.

Vertical drop: The elevational difference in number of feet between the highest point of a ski area serviced by a lift and the lowest point serviced by a lift.

Vertical rise: The elevational difference in number of feet between the bottom and top of a lift.

Vertical Transport Feet per hour (VTF/hr): A numerical expression measuring the uphill transportation capacity of chairlifts and tramways. Mathematically, it is the product of a lift's actual operating capacity per hour and the vertical rise of the lift.

"Wasatch Front Resident" ski areas: Those ski areas located near the Wasatch Front metropolitan areas which receive over 50 percent of their annual skier visits by Utah residents, as reported by Hunt (1974).